RAILROAD GAZETTE

FRIDAY, MAY 8, 1903.

CONTENTS

Contributions

An Anti-Scale Boiler Tube Coating.

Seattle, Wash., April 28, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

For the information of your readers, more especially motive-power officials, it is desired to announce that after several tests there has been discovered a product which successfully and economically varnishes or coats the interior boiler and pipe surfaces, rendering any and all affinity between scale and metal impracticable. This is done absolutely on a non-corrosive basis and to the improvement, not the detriment, of the heating surfaces. Irrespective of the character of the water and without any chemical or purification plans, the coating of the surfaces is carried on either in a boiler already badly fouled by simultaneous removal of scale, or in new boilers at the commencement of their career, or at periodical cleanings of boilers. To treat the boiler, not the water, is the basis of the operation, and it has been found to be successful.

J. FRANCIS LEE.

The Ten-Wheel and the Twelve-Wheel Locomotive.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The object of this article is not to make excuses for the existence of these back number arrangements of wheels. The writer desires to give all the obtainable data, and comparisons to show that the above mentioned arrangements are unnecessary in the practical railroad world of to-day. To begin with, I will say that as a practical railroad man (by this I mean one who has seen grief in the service) such arrangements never found any favor with me. Away back in the good old days we were told that the limit of weight on a driving journal was 10,000 lbs., and if a heavier engine was wanted, another pair of wheels must be added. This was before the advent of the "pony" truck. Apparently, no great strides have been made since then, for as rail weights have been increased, and larger engines demanded, this idea of our grandfathers still followed us, until we find some large roads still in the old rut. Mr. Emerson P. Waddle in a comparison of the "Atlantic" (4-4-2) type with the Marshall "Prairie" (2-6-2) type of the Lake Shore, says four wheel trucks to guide high speed engines are *pretty* good things, conveying to the mind of the layman the idea that a locomotive needed steering, as does a canal boat. Which reminds me of a remark made by a certain young lady: "But I should think, Mr. Cheney, it would be hard to keep them on the track after dark." "Well, no, not very hard; and you see we have the headlight burning then, which helps out." This seemed to satisfy her, and the subject was dropped.

For comparison let us look at the C. R. R. of N. J. ten-wheel (4-6-0) engine (*Railroad Gazette*, July 4, 1902, p. 533). There is an engine with 41,000 lbs. on a four-wheel truck and but 120,000 lbs. on the six drivers—20,000 on each journal, not at all excessive, a little over 200 lbs. per sq. in. Now if we could only manage to steer (?) this engine with a "pony" truck, putting one-half or more of the weight now carried on the four-wheel truck on to the drivers, there would be all that extra weight available for traction, and the load per journal would not then be in excess of general practice. Or if we wanted to be on the safe side, there is room to increase the size of journal and decrease the pressure per sq. in. Look now at the Lake Shore engine (2-6-2 type), which has 135,000 lbs. on six journals, or 22,500 lbs. on one journal. According to all accounts, these engines have been record breakers in service, and have been successfully *steered* with a "pony" truck, while all admirers of good lines are agreed that they cannot be excelled for beauty of design.

It is not so many years since the Burlington ran its fast mail trains out of Chicago with a 2-6-0 type, and as far as I know, the *steering* gear worked all right. Mr. Waddle says this type is murderous to the roadbed. This I am not able to refute, not having been in the maintenance of way business. But it strikes me they cannot be any worse on the roadbed than the 4-6-0, the 2-8-0, or the 4-8-0 types. About two years ago the Santa Fe built several 4-6-0 type engines for heavy mountain work, and a year later, being a year older, and of a progressive, up-to-date disposition, built a number of the 2-6-2 type with compound cylinders, 135,000 lbs. on drivers, the remaining 55,000 being on the leading and trailing wheels. The wheel base is 13 ft. 8 in., and these engines have about 15 per cent. more tractive power than the most powerful previous design on that road. With the substitution of the "pony" for the four-wheel truck a corresponding increase of adhesion should be available.

Let us take another example from the *Railroad Gazette*, Aug. 1, 1902,—a 4-6-2 type for the Missouri Pacific. This engine weighs 173,000 lbs., with but 120,000 lbs. available for tractive adhesion, and 20,000 lbs. on a 9 in. x 12 in. journal. These journals would carry with ease an additional 3,000, making an engine that would stand up without sand under very trying conditions, as the tractive effort is 25,600 lbs.

There are in this section numerous examples of ten-wheel freight engines, and with very few exceptions a very unsatisfactory engine that ought to have a sand car next the tender and a pneumatic sand box filler. With this arrangement they could be got over the road, but it strikes me that so much sand, while being a good traction increaser, is not very good for running parts. Take for example a 4-6-0 type, with the "Pennsylvania" guide, sand pipe ahead of forward drivers. Even with a patent sander, these guides get a liberal share of the sand. If we must have wheels to carry our engine weight, why not have a 2-8-0 engine and get the benefit of the weight for adhesion, and not be pushing 20 or more tons of useless weight over the road?

I have before me but one example of a 4-8-0 type. This engine has but 139,000 lbs. (of a total of 172,000 lbs.) on the drivers, making a difference of 33,000 lbs., half of which, if added to the 139,000, would put a load of but 19,437 lbs. on a journal, as against 17,275 lbs. with the four-wheel truck, thereby increasing the adhesion and lessening the work of the sand man, and saving many bad words from the runner, and possibly the adding of a few cars more to the train, which would make the Yard Master smile. All these things are to be considered in these days of railroad hustling. The writer has had disagreeable experiences with slippery engines, one particular case of which comes to mind—a 4-4-0 type of the bygone days, would slip with 50 lbs. of steam, and with 100 it would dance. Again, it has been my pleasure to run engines that would stand right up to business with a full throttle as soon as slack in the train was taken up, this latter case being considered one of proper adhesion. In conclusion, the 4-6-0 type and the 4-6-2 type might be satisfactory engines for passenger work if provided with the "increaser," now coming into more general use and controlled by the position of the lever, but there are cases of bad rail where this would not be available, as it would not be advisable to "drop them down" to bring the device into use.

J. V. N. CHENEY.

The Air-Brake Convention.

The tenth annual convention of the Air-Brake Association was held at Colorado Springs, Colo., April 28, 29 and 30. In the absence of the President and First Vice-President, the Second Vice-President, Mr. E. G. Desoe, of the Boston & Albany, presided. The Association was welcomed by Mayor Harris, after which the Chairman read his address. The Secretary's report showed that 86 members had been added during the year, the total membership now being 700. The Treasurer reported a balance in the treasury of $1,383.

The officers for the ensuing year are: President, E. G. Desoe, Boston & Albany; First Vice-President, J. Hume, Jr., Houston & Texas Central; Second Vice-President, L. M. Carlton, Chicago & North Western; Third Vice-President, W. P. Garabrant, Pennsylvania; Secretary, F. M. Nellis, Locomotive Engineering, New York (re-elected); Treasurer, Otto Best, Nashville, Chattanooga & St. Louis (re-elected); Members of the Executive Committee, W. L. Clendenen (Colorado Midland), and J. W. Hardy (Colorado Midland). Buffalo, N. Y., was selected as the next place of meeting, the time to be May 10, two weeks later than heretofore.

The members were entertained by trips up Pike's Peak, over the "Short Line" to Summit, and over the Colorado Midland to Divide on the afternoons of the three days of the convention. Carriage rides to points of interest were provided for the ladies. For those who remained after the close of the convention the railroads provided free transportation to Greenwood Springs, Cripple Creek or Denver.

Following are abstracts of the reports and the discussions on them, and also of the topical discussions.

WATER IN TRAIN PIPES.

The committee which reported on "Frozen Train Pipes; Their Cause and Prevention," last year was continued with a view to obtaining further information on this subject, and particularly to ascertain, if possible, the length of cooling pipe necessary to reduce the compressed air to the temperature of the atmosphere before it reaches the engineer's valve. The committee concluded that this length is influenced, (1) by the volume of air compressed; (2) by the temperature of the air delivered to the pump; (3) by the diameter of the cooling pipe; (4) by the heat radiating from the boiler; (5) by the percentage of moisture in the atmosphere; (6) by the atmospheric conditions affecting the radiation of heat from the pipe.

Tests were made with a 9½-in. pump and a 1¼-in. pipe, the pipe being placed so that the boiler heat would not affect it. The humidity of the atmosphere was 50 per cent., and the wind was blowing. It was found that with the pump running 39 strokes a minute, the discharge temperature was 328 deg. It required 37 ft. of pipe to cool this to the temperature of the atmosphere, 18 deg.

By means of glass tubes introduced into the line the formation of frost in the line when the air had reached a temperature below freezing was shown; indicating that the cooling line would become closed from the accumulated frost if made too long. If additional cooling pipe is necessary it should be placed between the first and second reservoirs.

The tests show that the volume of air compressed affects the cooling; therefore leakages should be guarded against. Two ways other than the use of a single pipe were suggested for cooling the air. One was to sub-divide the flow of air to the reservoir by using two or more pipes; the other was to have a reservoir with several tubes through it, open to the atmosphere.

Water sometimes gets into the train line from the yard testing plant. For this there is no excuse.

The importance of having the brake on every car in a train in good working order was referred to, and was illustrated by quotations from Mr. P. H. Dudley, showing the energy required to be overcome in stopping a train at speed.

The committee recommended that when the single-pipe method for cooling is used the lengths be about as follows: Between pump and first reservoir, 49 ft.; between first and second reservoirs, 27 ft.; total, 76 ft.; reservoirs, 126 in. x 16 in. It was also recommended that all air pipes be thoroughly blown out in cold weather just before the engine leaves the house.

Discussion.

The discussion of the report consisted largely of the citation by different members of instances where the trouble from water in the train pipe had been cured by increasing the length of pipe between the pump and reservoir, or by the addition of a reservoir, all of which was in agreement with the results obtained by the committee. In one or two cases it was said that difficulty was experienced only at temperatures slightly below freezing, very cold weather not causing any trouble.

Mr. P. J. Langan (D., L. & W.) said that his road had placed a limit on the pump speed, not to exceed 140 single strokes a minute, regardless of the length of the train. They have had no pump failures for four months, although previous to the adoption of this rule it was found impossible to keep up the pump repairs. This speed would charge a 50,000-cu. in. reservoir at the rate of 20 lbs. a minute, and that with a 9½-in. pump at this maximum speed and a 45,000-cu. in. reservoir they easily handle a 75-car train down hill; and that on the Lackawanna they handle trains of 115 empties or 87 loads.

Mr. F. M. Nellis suggested that the train line required careful attention as well as the pump. Train-line leaks cause needless working of the pump, keeping the air cylinders hotter and therefore giving a higher discharge temperature. Main reservoirs should be long and of comparatively small diameter, offering more surface for radiation; but the Association should not go on record as recommending any definite length of pipe between the pump and the reservoir as conditions are too variable.

Mr. L. M. Carlton (C. & N. W.) said they were limiting their pump speeds in order to reduce the moisture, and found 130 to 140 single strokes a minute satisfactory. With the slow speeds they had no frozen train pipes.

Mr. C. C. Farmer (W. A. B. Co.) pointed out that the efficiency of a pump so soon becomes impaired at high speeds that it might be said not to have its greatest capacity at these speeds.

Mr. Nellis: The humidity of the atmosphere is a more important factor than the temperature. Where the atmosphere is dry there is little or no trouble from this source.

Mr. J. R. Alexander (P. R. R.) said that in the future the Pennsylvania would use 21 ft. of pipe between pump and first reservoir, and the same between the first and second. The second will be of the long, small-diameter pattern, arranged for easy draining.

Mr. C. B. Conger (Int. Cor. Schools): The methods

of different enginemen in handling their air and pumps may make much difference in the amount of moisture in the train line. Again, if the piping is so placed that the air is heated in passing from the first to the second reservoirs the air will pick up moisture instead of depositing it.

Mr. A. B. Brown (W. A. B. Co.): On one class of passenger engines on the Canadian Pacific the reservoirs are placed under the tender, where they have to be rectangular in section. A metallic connection having an automatic drip is used between the engine and tender and there is no difficulty from frozen pipes.

THE HIGH-SPEED BRAKE.

The committee report consisted simply of extracts from letters from individual members. One member writes: "Our experience with the high-speed brake has been very pleasing. We have it in use now on about 40 trains, which include both through and local, and we have no record of wheels sliding. It is important to keep train pipes free from leaks, which will prevent quick action of brakes when a service application is desired. We find brakes which will give quick action where the 10 in. x 12 in. equalizing reservoir is used. This is overcome by the introduction of the special equalizing reservoir 10 in. x 14½ in., which contains about 800 cu. in., or about 160 cu. in. more than the 10 in. x 12 in. reservoir. Great care must be given to the graduating spring to see that each triple valve has the proper tension in spring.

"The claim of 30 per cent. less distance in a stop with the high-speed brake has been fully demonstrated in actual tests in service with the emergency application from high speeds. Another great advantage with the high-speed brake is in being able to make two or three service applications without recharging auxiliaries while still keeping enough air to obtain a full emergency application such as is usually obtained with 70 lbs.

"The reducing valve should be located so as to attach the gage for testing without removal of valve; if this is not convenient, a suitable connection should be placed in the pipe so that the gage can be attached. At exhaust port the importance of a service elbow should be fully appreciated. The cork in the check nut for the spring box of the high-pressure valve should be drawn from cap instead of being driven inside, as the air pressure passing piston sometimes forces this cork over the relief port in check nut, preventing the escape of air, and consequently preventing the reduction in the brake cylinder pressure.

"Following are some figures showing the distance of stops at different speeds, with the high-speed brake as compared with the ordinary 70 lbs. pressure, in some tests recently made, using an emergency application on level track.

No. of cars.	Train pipe pressure.	Speed, miles per hour.	Distance run, feet.
..	70	50	840
..	110	50	700
..	70	55	1,095
..	110	55	830
..	70	60	1,330
..	110	60	1,030
..	70	65	1,635
..	110	65	1,300
..	70	70	2,010
..	110	70	1,530
..	70	75	2,295
..	110	75	1,840
..	70	80	2,640
..	110	80	2,240

Another member writes: "At the time the high-speed equipment was first introduced, it was intended only for trains that run at a very high speed; such trains consisted of from three to five cars, and it was not necessary to carry more than 10 lbs. additional pressure. But today it has become general to equip all trains with the high-speed equipment, which means trains of from one to any number of cars; therefore the question is often asked: Is 10 lbs. excess pressure sufficient to assure a release of all brakes on trains of any length? I think it is not. A train of 12 passenger cars is equal in length to a train of about 22 freight cars; and 10 lbs. excess is not sufficient to give a sure and prompt release of all brakes on such a train. The committee should recommend that the pressure in the main reservoir be 130 lbs., making 20 lbs. excess instead of 10 lbs. As there are but few leaks in passenger equipment the pump will not have to work unduly to maintain 130 lbs.

"All feed valves that are used with the high-speed equipment should be stenciled the pressure they are set to carry; so that the operator will not get them mixed; there are two valves secured to one reversing cock, and there is no way of telling one from the other."

Another member urges the application of brakes to all wheels of locomotives, including trailing wheels. Roads equipped with high-speed brakes and neglecting to brake the truck and trailing wheels of locomotives are overlooking an important factor.

Another member writes: "We are not troubled with flat wheels on cars on our high-speed braking trains. Our men have learned to be careful about using the emergency at low speed, as such would surely slide wheels owing to the limit of time for reduction of brake cylinder pressure. I prefer a 10 in. x 14½ in. reservoir for the brake valve. We had some trouble by getting a quick-action application during service reduction, but putting on 10 in. x 14½ in. reservoirs stopped that. We set the driver brake reducing valve at 50 lbs., having had some driving wheel sliding previous to that."

Discussion.

J. W. Libbey (Lake Shore) announced that his road had adopted for high-speed brakes a main reservoir pressure of 125 lbs., giving 15 lbs. excess pressure.

In speaking of the high-speed brake on the Burlington, Mr. G. Budig states that on their tender triples, which are the ordinary freight triple, they had found the graduating springs too weak and had substituted passenger triple springs with satisfactory results. Also, they at first placed two feed valves under the running board, but they froze up and were changed to the cab. Parts of their high-speed equipment are painted red so that the men will have no difficulty in distinguishing the apparatus.

In reference to leaks due to the high pressure maintained Mr. Geo. Frederick (P., B. & W.) had gone over a train line carefully with soapsuds and found it to be tight; yet at 70 lbs. this leakage in two minutes ran up to 2 lbs., and with 110 lbs. it would reach 10 lbs.

Mr. G. B. Culver (N. Y. C.): On the Empire Express, a four-car train, we have no trouble from skidded wheels, while on six-car trains they do occur. This was with 110 lbs. train line, and 120 lbs. main reservoir pressure, An increase of at least 20 lbs. should be made.

Mr. Conger inquired if it would not be an advantage to increase the size of the train pipe on long passenger trains from 1 in. to 1¼ in., the size on freight trains. Mr. Carlton thought the increased volume would neutralize the effect of the excess pressure. Tests had shown that the action of the air in the train pipe of a long passenger train is sufficiently rapid to make unnecessary an increased diameter.

Mr. J. P. Kelly (N. Y. A. B. Co.) advocated an increased train pipe pressure to give increased braking force throughout the train. But there are three considerations affecting an increase of braking power. 1. What is the right limit to train pipe pressure? 2. What would be the allowable increase in size of parts of foundation gear; 3. What is the coefficient of friction of the brake-shoes? A high coefficient of friction will permit the use of a lower brake-cylinder pressure and lighter foundation gear than a lower coefficient. He favored an increase of train-line pressure to something higher than 70 lbs.

Mr. Nellis: Brake-shoes are an uncertain factor to depend on. The endeavor should be to have shoes that will give the best wear and stopping ability. In regard to foundation gear, it is not necessary, in applying high-speed brakes, to change the gear if it comes up to M. C. B. specifications. Air-brake men should keep abreast of the advance in car construction; and the gear should be made equal to the brake.

An inquiry regarding the use of the high-speed brake in local or suburban service brought a reply from Mr. Garabrant, who said that 12 trains in this service thus equipped were much liked by the men. As to the life of hose in high-speed service no difference had been observed.

Mr. Desoe said that according to the enginemen a 5 lb. to 10 lb. reduction appeared to give a heavier application on high-speed than on ordinary brakes. Mr. Carlton said the engineman in making such reduction went by the time rather than by the gage; in the same time a greater reduction would occur in the high-pressure than in the lower. Mr. Nellis: Certain roads carry as high as 30 lbs. excess pressure, and one carries 35 lbs. The prescribed 10 lbs. excess is not a fixed rule.

Mr. Conger offered a resolution to the effect that the amount of excess pressure for high-speed brakes be proportioned to the length of the train, as is the case now with the ordinary brakes. This resolution was adopted.

It was voted that extracts from some recently-published articles on brake-shoes be printed in the Proceedings in connection with this paper.

[Topical Discussions.]

THE COMBINED STRAIGHT-AIR AND AUTOMATIC ENGINE AND TENDER BRAKE.

(F. B. Farmer.)

All who have been in touch with switching and road work are familiar with the complaints about the inadequacy of automatic brakes for switch engines, the frequent use of the reverse lever on engines so equipped, the many schemes and devices employed to hold the driver brake applied when the automatic is in release, and the very decided preference expressed by engineers for the straight-air, vacuum or steam brake on the drivers and tender of switchers and freight locomotives. The straight-air brake would have been valuable several years ago, but with the increased number of air-brakes per train, heavier locomotives, necessity for rapid work and pressure to decrease the damage incident to switching and road work, it becomes an essential. The independent brake has been condemned, because it either eliminated or seriously interfered with the automatic; but in the device in question the automatic remains as it was; always cut in on both driver and tender brakes and acting with the car brakes whenever the automatic brake valve is used. So, too, is the straight-air cut in at all times, responding on the driver and tender brakes whenever the straight-air brake valve is used.

The value of the straight-air may be stated as follows:

1. To quicken switching and reduce the incident damage to lading and equipment. The holding power and possible speed of application never vary from one application to another and thus inspire confidence. The release is practically instantaneous. The holding power can be quickly increased little or much. Application immediately following release is never delayed. The driver and tender brake cylinders being connected when using straight air, the distribution of brake power is not affected by piston travel or cylinder leakage, and there is, therefore, less liability of wheel sliding.

2. To permit of brake release on long trains without danger of slack running out suddenly and train breaking in two, otherwise so liable to occur at slow speed. This prevents loss of time and occasional damage incident to starting a train in an unfavorable place at which the only reason for coming to a stop would be the danger of breaking in two by releasing.

3. To prevent change of grade (sags or humps) or curvature from running the slack of long trains in or out so suddenly as to cause severe shocks and train separation.

4. To slow or stop trains where the brake work required is not heavy, thus reducing pump labor, stuck brakes, wheel sliding and the break-in-twos incident to an endeavor to start long trains with brake-shoes dragging on cars near the rear end, a not uncommon result with freight car brakes held on to the stop. The reduction in brakes sticking is due to the fact that light applications from full pressure are, in all probability, indirectly a most common cause of stuck brakes. A light application of all brakes on a long train gives very little return in holding power for the amount of air used.

The absence of brake-beam springs on freight cars requires some train movement to shake the shoes loose from the wheels where brakes have been held on to a stop. By rendering it safe to release the automatic at low speeds this dragging of brake shoes can be avoided.

5. To prevent the slack from running out, and to aid in controlling the speed while recharging on descending heavy grades. To prevent overheating of driver and tender wheels at such times the ½-in. cut out cocks—one being connected between the double check valve and triple valve of each of the two brakes and located convenient for operation while running—should be left open. Thus, while these auxiliary reservoirs are recharged with those of the train, automatic application is prevented, and the engineer is, therefore, able to make the fullest practicable use of the driver and tender brakes. The lower maximum speeds and more thorough recharging of auxiliary reservoirs which this accomplishes increases the train safety far more than is possible with the greatest practicable use of automatic alone on these two brakes.

6. To hold the train or locomotive and keep the automatic brakes recharged when standing on grades, thus having train brakes ready for instant use at the start.

The application position of the straight-air brake valve renders it impossible for the driver and tender brake to leak off. This latter prevents the locomotive from getting away when no one is present, even though the throttle leaks. With the train standing and slack bunched, the straight-air can hold a long train on quite a heavy descending grade. The starting of undercharged trains having a reduced pressure through the previous brake application and subsequent leakage is a dangerous feature too frequently met with on heavy grades . . . The additional parts, with the following exceptions, reduce, rather than increase, the labor and expense of engine brake maintenance. More frequent adjustment of driver and tender brake piston travel is necessary than with automatic alone, because of the increased labor these brakes perform, but there is less reversing. The double check valve and straight-air brake valve are the only additions to standard brake parts. These seldom require repairs. While the apparatus can be abused, yet no other manipulated by the engineer requires that he be given so little instruction or that he exercise so little skill and judgment to obtain satisfactory results.

In view of these advantages it may be asked why switch engines should not be equipped with straight-air alone. The reasons are that such engines may at any time be used where it is necessary to have the use of car brakes; may be called upon to promptly move a freight train left in the yard with brakes set, etc.

In freight train service on level roads with long freight trains nearly or fully air-braked, breaking in two, brakes sticking, wheels sliding and excessive pump labor are frequent and undesirable features which it has been demonstrated the straight-air will materially reduce.

Mainly because of the danger of loosening driver tires, the straight-air and the automatic cannot both be used while descending a steep grade; hence the provision for rendering the automatic inoperative during such time. This permits of heavy use of the driver and tender brakes while recharging the train brakes and, as well, guards against possible shocks from slack running out suddenly when the speed has been brought low to aid in recharging. The absence of automatic application on these two brakes, low speed while recharging a heavy train, and comparatively short time required permit of a strong straight-air application without danger of overheating.

Discussion.

Mr. J. H. Stricklan (D. M. & N.) said that his road had the straight-air brake on 44 engines (their total equipment), having begun its application over two years ago. He cited an instance where a train of 50 loads of ore, with the retainers up, had been stopped on a two per cent. grade and held for 25 minutes, it having been recharged meanwhile with the automatic brake valve at release. In another case 75 loads were slackened to 5 m.p.h. and released without a jerk. In switching at the mines cars can be "spotted" on steep grades, if there are only a few of them, by use of the straight-air alone; if there are as many as 15 or 20, both the straight-air and the automatic are used. In the matter of tire wear they have records of five engines that have made 120,000 miles each, and they are starting the present season without having had their tires turned. There is no excuse for sliding the drivers as they can be released instantly and reapplied as quickly. If the straight-air is applied and the automatic on top of it, it gives a high braking power.

On account of this a release valve is used between the double check valve and the brake cylinder so that the engineman can release the drivers the instant they begin to slide.

They use the straight-air in passenger service also, the advantage being that the train brakes can be released just before the train comes to a stop and the straight-air applied, avoiding the unpleasant lurch which occurs when the train brakes are left on until the train comes to a standstill.

The cost of maintenance of the straight-air has been practically nil. Break-in-twos have been reduced 10 per cent., credited to straight-air. An automatic slack-adjuster and straight-air make a good tender brake, as enginemen neglect the adjustment of these brakes. The most convenient place for the valve is on the side of the cab in front of the engineman.

Mr. C. S. Larrison (N. P.) said his road had 20 switchers and one road engine equipped with straight-air.

Mr. J. W. Libbey (Lake Shore): The instructions for straight-air brakes specify 45 lbs. as the setting for the feed valve. This has caused some slid wheels, and we have reduced the pressure to 35 lbs. The engineer's valve is put ahead of and above the automatic valve, about 6 in. each way.

Mr. S. D. Hutchins (W. A. B. Co.) related an instance concerning a straight-air braked engine, used on the Louisville & Nashville on a 217-ft. grade as a pusher, and also to help hold trains going down the hill. On this occasion 26 loads, 24 of which were air cars, were being dropped down the hill. They were brought to a stop (retainers up) and the front engine valve was thrown to full release. It was necessary to release the straight-air on the second engine before the train would start.

In regard to the use of a safety valve with straight-air, Mr. Farmer said they prevent excessive pressure when the straight-air has been applied on top of the automatic. In no case should they be set below 53 lbs. The instructions say that the automatic should not be applied on top of the straight-air, except on mountain grades where a special arrangement permits the air for the automatic to blow into the atmosphere instead of going to the engine brake cylinders.

Mr. Stricklan said there had been a reduction in flat wheels on his road. In the ore trade the cars are all empty one way, and the engineman often will slow down and even stop a train of these with only the straight-air.

Mr. Desoe (B. & A.) said he had been using a straight-air arrangement for eight years, his purpose being to prevent long trains from breaking in two.

THE EFFICIENCY OF AIR PUMPS.

Mr. Libbey: The Lake Shore test requires that a 9½-in. pump maintain reservoir pressure against a $^{3}/_{16}$-in. orifice.

Mr. L. M. Carlton: The thickness of the plate containing the orifice is an important condition, as thickness increases the friction.

Mr. Libbey: Our plate is $^{3}/_{16}$-in. thick.

Mr. Farmer: Putting these plates in the line at the back of the tender is unreliable, particularly in cold weather.

Mr. Carlton: The idea in putting them at the back of the tender is to include all leaks and line defects to this point.

The Boston & Albany test, described by Mr. Desoe, requires 23 strokes of the pump a minute, 20 lbs. pressure being maintained through a $^{1}/_{16}$-in. orifice. If the pump runs up to 33 strokes it is condemned.

A test known as the "oil cup" test, used in the Northwest, was described by Mr. F. B. Farmer. The pressure is pumped up to about 100 lbs., and then, by throttling, the speed is reduced to give about 30 exhausts a minute. When the piston goes down it is noted whether there is a blow at the oil cup. Such a blow would indicate leakage past the piston, or back from the main reservoir. Pumps should be tested just prior to leaving the repair room.

Another test was described by Mr. G. R. Parker (G. N.). A gage is connected to the lower end of the air cylinder and the pump is run at about 20 strokes a minute, pumping against 90 lbs. The blow back past the piston is recorded on the gage. This amounts to 7 or 8 lbs. on a new or a newly rebored pump. If the leakage exceeds 12 lbs. the cylinder is rebored. About three-quarters of the stroke is accomplished before the gage begins to show anything.

Mr. L. M. Carlton (C. & N. W.): A medium speed is the best at which to run the pump. On North Western locomotives carrying high boiler pressures we put in the steam line a diaphragm having a ½-in. orifice in order to limit the speed at which the pump may be run. With an open throttle and these high boiler pressures a 9½-in. pump can be made to race to 205 strokes a minute.

Mr. Desoe: A diaphragm might be found objectionable in case of a lowered boiler pressure.

Mr. T. A. Hedendahl (W. A. B. Co.): Choking the steam line in mountainous districts might be a serious matter, as there are times when a pump must be run to its full capacity or control of the train will be lost.

STANDARD LENGTH OF BRAKE-BEAMS.

Mr. Hedendahl: With the standard length of brake-beam as prescribed by the M. C. B. Association, there are frequent cases where the entire surface of the brake shoe does not come in contact with the wheel tread, as the beam permits one shoe or the other to lap over the edge of the tread. This overlap tends to pull the beam still farther in the same direction, crowding the shoe on the opposite end tightly against the flange of the wheel. A length of 5 ft. or even less would be an improvement on the present standard of 5 ft. ½ in. between centers of heads.

Statements of different members showed that already many are using a length shorter than the standard. A committee was appointed to investigate the subject of brake-beams in general, and to determine by tests and other information what should be the proper length and adjustment of brake-beams.

New Stations For the National of Mexico and the Chicago & North Western.

The Chicago & North Western station, which is just reaching completion at Sioux City, Iowa, and the new station building for the National of Mexico, at Monterey, Mexico, are shown together, as illustrating characteristically different methods of architectural treatment for buildings comparable in size. Monterey has a population of nearly 46,000; Sioux City is slightly smaller. Both cities are geographically important, and both are competitive points.

The new Monterey station is a result of the recent policy of standard gaging the line and making general betterments to put it on a modern basis. The station buildings in particular have received a great deal of attention, and the designs have been carried out in a practical and modern type of architecture, no attempt having been made to follow the Mexican type of building prevalent throughout the country.

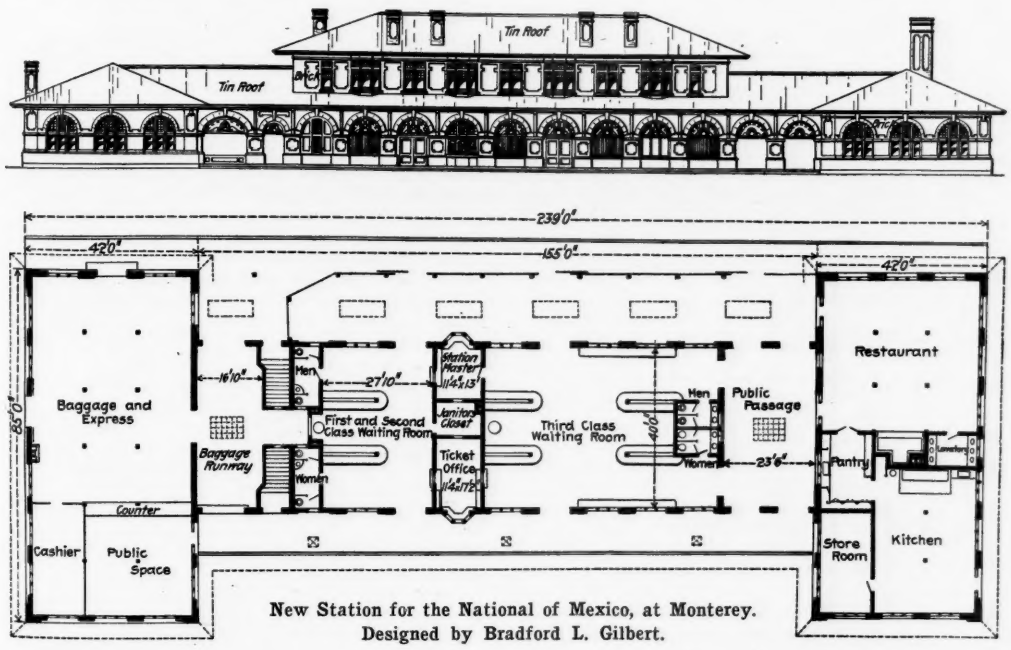
Monterey is an important point on the road, a very charming old city, and to the traveler one of the first and most interesting points after leaving the border. The place is growing, and this new station is designed to meet the increasing requirements of the passenger and traffic departments. The building is designed in a style of Renaissance which is peculiarly adapted to local conditions as not marring or being out of harmony with the best type of local imported architecture.

The broad over-hanging eaves and awnings, emphasized by their heavy shadows and the long horizontal lines of the design, give a simplicity and restfulness to the whole, while interest and variety are obtained by the succession of projecting bay windows and various projections and deeper shadows of the central arcade. The main wall surfaces are of dark red brick, with deeply raked joints, giving an interesting surface value, while the trimmings and base are of fine pressed brick manufactured in the locality, the stone work being of local gray granite. All of the openings on the ground floor are protected with ornamental wrought iron grilles.

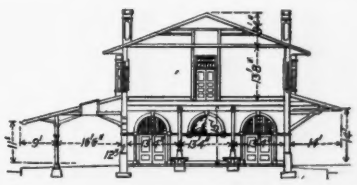
Elevation of Sioux City Station.

The main central pavilion is two stories in height, each about 14 ft. high. The main floor contains the first and second class waiting room, 30x40 ft., and a third class waiting room, 40x58 ft., with separate lavatory accommodations for each room; also large, generous, well lighted and well ventilated ticket and telegraph offices, in addition to ample restaurant and open passageways and exits to and from trains, and also an enclosed concourse adjoining trainshed, for passengers. The baggage and express rooms are especially designed for the large traffic of the road. The symmetrical wings at either end of the main building are utilized for the restaurant and baggage accommodations, adjoining which are generous wagon yards on either side of the station, enclosed by masonry walls. Along the track side extends a covered public concourse and baggage gangway 25 ft. wide. The keynote of the entire plan is that of simplicity and convenience of arrangement, together with a perfect freedom of access and circulation and control and security of passengers.

A wide stairway leads to the second story offices, opening both on the street and track sides of the station. Provision is made in the second story for the trainmaster's, division superintendent's, roadmaster's and despatcher's offices, in a space containing over 4,200 sq. ft.



New Station for the National of Mexico, at Monterey. Designed by Bradford L. Gilbert.



Section Through Third Class Waiting Room, Monterey Station.

The building, in connection with a number of others on the same line, including the Colonial station at the City of Mexico, previously described in these columns, was designed by Mr. Bradford L. Gilbert, of New York, who has been very successful in his simple and dignified treatment of stations.

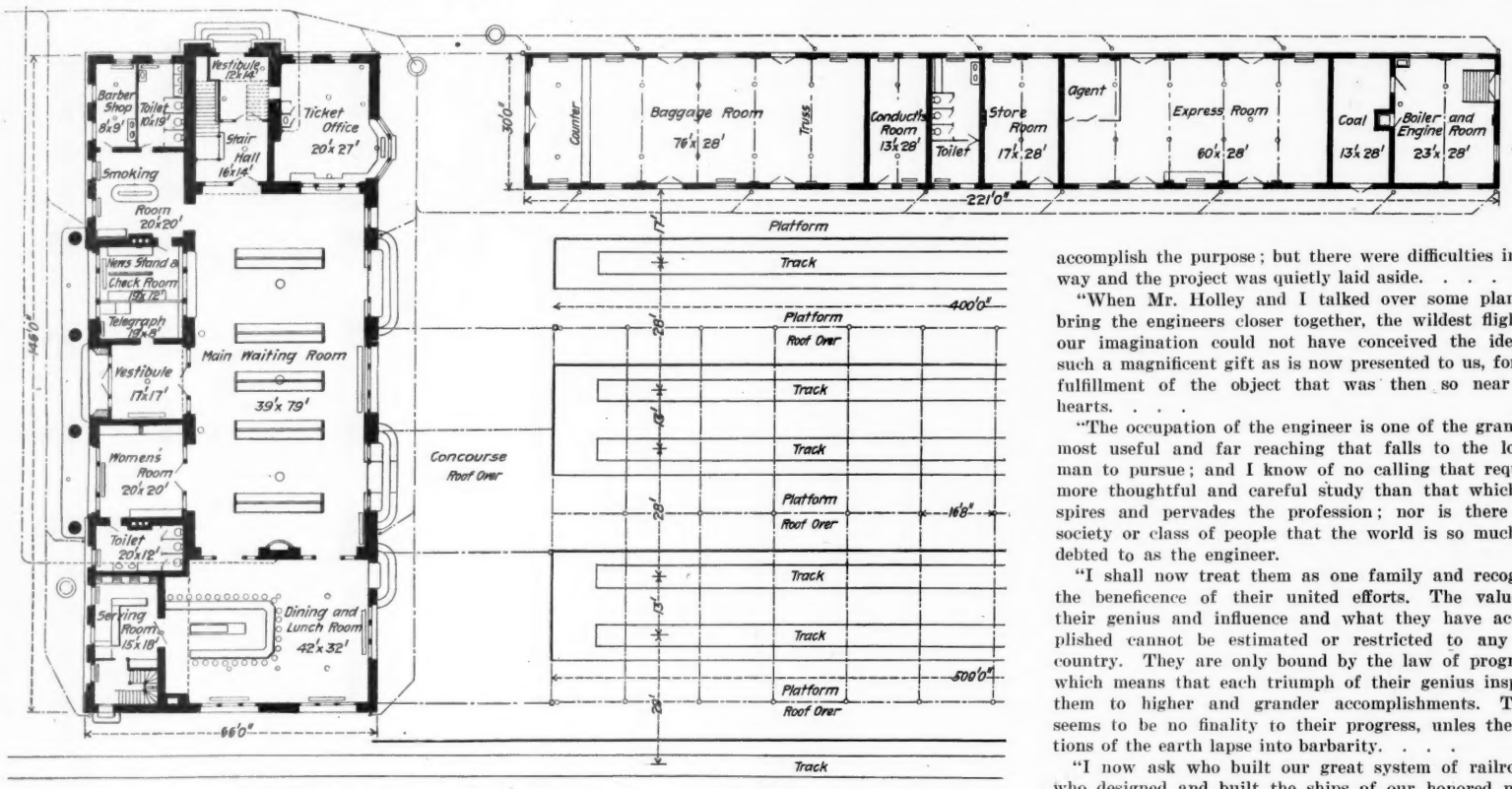
The Chicago & North Western Sioux City station is at the corner of Second and Nebraska streets, Sioux City, the building being set 75 ft. back from the street. The intervening space is to be laid out as a park, enhancing the appearance of the building and providing liberal space for carriage drives and entrance.

The main building is 66 ft. x 146 ft., three stories high, with a clock tower on the Second street front rising to 128 ft. above the street. The foundations rest upon piling. The walls are pressed brick with Bedford stone trimmings, and the roof is of tiling. The architecture follows the Renaissance style. The main, or Nebraska street entrance is adorned with a stone portico, having massive Doric columns, and it adds much to the general effect. A vestibule 17 ft. square leads from this entrance to the main waiting room, which is 39 ft. x 79 ft., and extends through the second story, the ceiling being 26 ft. high. The finish of the room is in different colored woods, and the ceiling is divided into panels by heavy wooden beams. The Second street entrance is under the

clock tower through a vestibule 12 ft. x 14 ft., and a stair hall 16 ft. x 14 ft., from which stairs lead to the upper floors.

At the north end of the waiting room, on the east side of the tower, is the ticket office, 20 ft. x 27 ft., while ranged along the west side are toilet and smoking rooms, news stand, telegraph office, barber shop, etc. The south end is occupied by the restaurant, except the southwest corner, where there is a hallway for rear stairs. On the second floor the space is limited to that surrounding the waiting room. The restaurant kitchen is on this floor, while the rest of the space and the entire third floor is used for offices of the Superintendent and other officers at Sioux City. The arrangement of the building gives abundant light. The finish of the offices is oak, and the stairways are ornamental cast-iron with slate treads. The waiting room and vestibule floors are marble, the other floors of the first story being of tile.

There are five tracks in the station, with three umbrella



Chicago & North Western Passenger Station at Sioux City.

sheds for protection. Two of these sheds are 400 ft. long and the third 500 ft. long. Between the tracks and headhouse there is a concourse 40 ft. wide, roofed over with steel and slate. Extending along Second street for 221 ft. is a one-story brick building 30 ft. wide, in which are the baggage room, 76 ft. long; the express room, 60 ft. long; also a conductors' room, store room, boiler and engine room, coal room for the latter, and toilet rooms. Electric light and steam heat will be furnished to the station from the plant in this building.

In addition to the improvement in its passenger terminals, the North Western is improving its freight terminals at Sioux City by the extension of the freight yards. The purpose is to enable more expeditious handling of carload business, as well as the large number of less-than-carload consignments received at Sioux City, which is an important jobbing center. When all improvements are completed it is expected that the transportation conveniences of Sioux City will be on an equality with those of any point of like importance in the country.

A Union Engineering Building.

Mr. Andrew Carnegie has offered to give one million dollars for an engineering building in New York City. The following letter addressed to the four national engineering societies and to the Engineer's Club of New York was written Feb. 14: "It will give me great pleasure to give, say, one million dollars to erect a suitable Union Building for you all, as the same may be needed." Mr. Carnegie first made known his purpose on Feb. 10 to Mr. C. F. Scott, President of the American Institute of Electrical Engineers, and Mr. C. W. Rice. He had been interested in the suggestion of a common building for the various societies, made at the annual dinner of the A. I. E. E. These gentlemen immediately took steps to follow Mr. Carnegie's suggestion to present the matter to the several engineering societies. In consequence, a meeting was held at the Engineers' Club on Feb. 11, those present being, Messrs, Alfred Noble, C. W. Hunt, Charles Kirchhoff, Prof. F. R. Hutton, Major W. H. Wiley, C. F. Scott, C. W. Rice, J. C. Kafer, J. Thomson, W. A. Redding and John Fritz. The general sentiment of the meeting was that the plan was feasible, and the matter was placed in the hands of a committee consisting principally of gentlemen connected with the Engineers' Realty Company, an organization which has in hand the building enterprise of the Engineers' Club. This committee conferred with Mr. Carnegie, who formally offered the sum named at the beginning of this paragraph.

At the request of the committee the following named gentlemen met at a dinner at the Engineers' Club on April 30: John Fritz, J. C. Kafer, President of the Engineers' Club; Alfred Noble, President of the American Society of Civil Engineers; J. M. Dodge, President of the American Society of Mechanical Engineers; C. F. Scott, President of the American Institute of Electrical Engineers; G. E. Weed, B. B. Lawrence, E. E. Olcott, C. W. Rice, T. C. Martin, W. A. Redding and J. Thomson. Mr. Redding, in introducing Mr. Scott, said that the credit for bringing about this most desirable result was particularly due to Messrs. T. C. Martin, C. W. Rice and C. F. Scott. A report by the committee was presented, and is in part as follows:

"The site selected for the Union Engineering Building, for the Engineers' Club and the national societies on 40th and 39th streets, between Fifth and Sixth avenues, is the ideal spot in America for such a building. However widely the membership and the interests of a society may be scattered, New York City must be recognized as the engineering center of the country. The location selected is in the very heart of the coming business center of New York. The new Pennsylvania terminal with tunnels to Brooklyn and to the west, the new station of the New York Central, the facilities afforded by the Rapid Transit Subway all point to the vicinity of 40th street as the coming transportation and business center of the metropolis. It is also the center of the hotel district.

"The four general engineering societies named by Mr. Carnegie are but a part of the engineering societies which are to be benefited. There are numerous societies, many of them strong and vigorous, whose membership contains many of the members of the general societies. The work of these societies is of a high order, and taken in the aggregate it is a most important part of American engineering. Definite permanent headquarters and accommodations in the same building with those of other societies will be advantageous to the societies themselves, and will be of great convenience to their members.

"Some of the uses and advantages of a union building may be indicated in a general way without entering upon details. A large assembly hall will be available for lectures and for the holding of general conventions of engineering societies. A number of smaller halls will accommodate smaller audiences and will be suitable for monthly meetings of societies and for sectional or supplemental meetings at the time of conventions.

"The libraries of the several engineering societies placed in adjacent alcoves or rooms will constitute a magnificent engineering library.

"Rooms may be available for reading and writing. The building itself may become a gallery of portraits of eminent engineers and illustrations of engineering works.

"Accommodations for the administrative offices of the several engineering societies may be arranged to suit their various needs. Facilities for the officers, boards of direction, committees, as well as for the mailing, and possibly the printing, of transactions may be afforded.

Facilities may be arranged for the serving of luncheons or dinners at the time of conventions or meetings and for the holding of formal dinners and banquets. A common cuisine may serve the Engineers' Club and the engineering societies.

"The idea of Mr. Carnegie is significant in its very breadth. He has not imposed restrictions nor introduced details. In a single sentence he has presented a great opportunity, and places confidence in engineers that they will adequately meet it. The present is the time to expand; to construct a magnificent ideal; to picture what should be done, and to devise how it may be accomplished. There are plans to be arranged and details, perhaps perplexing, are to be worked out. Engineers are now called to work out for themselves a problem similar to those which they are continually solving for others.

"To us is committed a great trust on behalf of American Engineering. The real question to be decided is not whether we will accept it, but whether we can take the responsibility of refusing to administer it."

The following is an abstract of a letter from Mr. John Fritz, giving his views on the proposed plan:

" . . . The object of our meeting to-night is not new to me, but it is most interesting; for some years before the death of our lamented Holley, he and I had many talks on the subject that has called us together. At that time, the most we hoped to accomplish was to devise some means that would bring the engineering societies in closer touch with each other. We had a scheme which we thought was practicable, and would at least in a measure accomplish the purpose; but there were difficulties in the way and the project was quietly laid aside. . . .

"When Mr. Holley and I talked over some plans to bring the engineers closer together, the wildest flight of our imagination could not have conceived the idea of such a magnificent gift as is now presented to us, for the fulfillment of the object that was then so near our hearts. . . .

"The occupation of the engineer is one of the grandest, most useful and far reaching that falls to the lot of man to pursue; and I know of no calling that requires more thoughtful and careful study than that which inspires and pervades the profession; nor is there any society or class of people that the world is so much indebted to as the engineer.

"I shall now treat them as one family and recognize the beneficence of their united efforts. The value of their genius and influence and what they have accomplished cannot be estimated or restricted to any one country. They are only bound by the law of progress; which means that each triumph of their genius inspires them to higher and grander accomplishments. There seems to be no finality to their progress, unles the nations of the earth lapse into barbarity. . . .

"I now ask who built our great system of railroads, who designed and built the ships of our honored navy, and thousands of other works of merit that could be mentioned? The answer is the engineer. But no one society of engineers can claim that its members did it all; for it has all been accomplished by their united efforts. I most ardently hope they may still become more closely associated, both on social and on engineering lines.

"The societies are so interdependent, and overlap each other to such an extent, that to me it is most surprisingly strange that the efforts which have been made before this time to bring them in closer contact with each other, has not been successful. . . . What is now wanted is well-informed, liberal, broad-minded and many-sided men; and I am a firm believer, all other things being equal, that every man should know something of everything and everything of something. . . .

"By pursuing this method, all parties will be benefited and they will obtain certain practical knowledge and advantages that cannot be otherwise obtained. And I know of no plan by which this can be so well accomplished as that proposed, where all the specialists can conveniently meet each other and at the same time have access, under proper rules, to the various libraries. This would be the college of colleges. . . . As there has been nothing said regarding the Marine and Naval engineers, I have made no specific allusion to them; but I would like to see them all included, and also both the physical and analytical chemists."

The work has been well organized, options have been secured on the property, and the legal status of the project has been worked out. It is proposed to have each of the national engineering societies and the Engineers' Club appoint a committee of three to be composed of the president and two other members—this joint committee to have sole charge of the plan and be responsible for its final outcome.

Unloading Ties.

BY J. E. CONLEY.

Although the unloading of cross ties or fence posts is in itself a simple operation, a proper organization of the work may greatly decrease the cost of train service and distribute the ties so as to decrease the cost of subsequent operations. The foreman should assign at least two men to each car of ties and not more than six, since a greater number are in each other's way. The number of men to be assigned to each car will depend upon the number of cars of ties to be unloaded and possibly upon the time between regular trains. The foreman should provide the men on each car with a list showing the number of ties needed between successive

telegraph poles on each half mile of track; and he should also instruct the locomotive engineer to sound the whistle each mile and half mile. When the train is ready to start the foreman takes his place upon some car where he can see the ties as they are unloaded, and where he can be seen by the locomotive engineer. The foreman then, by signals to the engineer, gages the speed of the train so that the proper number of ties will be thrown off between successive telegraph poles.

For example, if a train of 15 cars of ties is to be unloaded and 45 ties are required to each space between successive telegraph poles, then the men should throw out three ties to each space until the engineer signals that the second half mile has been reached. The men unloading ties then examine the list to see how many ties are to be thrown out for each space of the second half mile, and so on until the whole train is unloaded. If this method is properly explained to the laborers and to the locomotive engineer the ties can be unloaded more quickly and more uniformly than by any other method.

The above method is most successfully operated when all the cars contain the same number of ties. If the number of cars to be unloaded is very great and the number of ties per car varies considerably, the foreman may be justified in sorting the cars to secure uniformity; but this process would not be justifiable if the number of ties per car differed only slightly, since it is better to waste the time of three or four men on a car than to delay the whole work-train to switch the cars.

Government Accident Bulletin No. 6.*

The Interstate Commerce Commission has issued its sixth quarterly bulletin, showing train accidents and casualties for the three months ending Dec. 31, 1902. The number of persons killed in train accidents during the quarter was 266, and of injured 2,788. Accidents of other kinds bring the total number of casualties up to 12,811 (938 killed and 11,873 injured). These accidents are classified in tables 1 and 2.

Table No. 1.—Casualties to persons.

	Passengers. Kil'd.	Inj'd.	Employees. Kil'd.	Inj'd.
Collisions	38	840	138	1,051
Derailments	2	240	67	405
Miscellaneous train accidents (excl. the above), incl. locomotive boiler explosions	..	17	21	235
Total train accidents	40	1,097	226	1,691
Coupling or uncoupling cars	..	...	63	713
While doing other work about trains or while attending switches	..	...	45	1,554
Coming in contact with overhead bridges, structures at side of track, etc.	1	5	21	268
Falling from cars or engines or while getting on or off	34	371	189	2,143
Other causes	9	301	310	3,730
Total (other than train accidents)	44	677	628	8,408
Total, all classes	84	1,774	854	10,099

A comparison of this quarter with the same quarter of last year (Bulletin 6 with Bulletin 2) shows large increases in most items, except passengers and employees killed in train accidents. The only accident in this bulletin that is prominent by reason of a large number of fatal casualties is the rear collision of passenger trains recorded in the fourteenth item (No. 50) of the large double-column table of causes. In this collision 27 passengers were killed. It occurred on a straight line, quite level, on a clear night. The engineman did not obey the red lights. The leading train was at a standstill short of the station; the engineman approaching sounded the whistle, indicating that he saw the red hand lantern swung by the brakeman, but he did not slacken speed; he evidently *assumed* that the train ahead was moving or was standing at or beyond the station. The engineman is reported as one of 21 years' experience, with a record which was good up to this time. This disaster affords an unusually striking illustration of one important difference between the time-interval and the space-interval principles of regulating trains. The report indicates that the engineman's terrible act was due to error as to just *where* the danger light was; a chief merit of the space-interval or block system is that the danger light is always in the same known location.

*The *Railroad Gazette* record of train accidents for the months covered by this bulletin will be found on page 945 of last year and on pages 49 and 118 of this year. Below is a list of the principal accidents in these three months, as shown in our record. To the items in this list we have appended the number of the corresponding item in the list of causes in the Government Bulletin, so far as we are able to identify the accidents.

Prominent Accidents in Railroad Gazette Records.

		Item No.
October	Ardmore, I. T.	5
	Menlo Park, N. J.	16
	Barree, Pa.	30
	Reelsville, Ind.	31
	Lewis, Tex.	9
	Oneida, Tenn.	21
November	Ayers, Ill.	..
December	Sunbright, Tenn.	34
	Byron, Cal.	14
	Quaker Valley, Pa.	*n*

The Government Bulletins for preceding quarters have been published in the *Railroad Gazette*, as follows:

Bulletin No. 5, p. 67, 1903. (Jan. 23.)
Bulletin No. 4, p. 833, 1902.
Bulletin No. 3, p. 607, 1902.
Bulletin No. 2, p. 508, 1902.
Bulletin No. 1, p. 309, 1902.

Table No. 2.—Collisions and Derailments.

	No.	Loss.	—Persons.— kil'd.	inj'd.
Collisions, rear	511	$481,013	69	645
Collisions, butting	265	546,731	64	668
Collisions, trains separating	791	370,147	25	363
Collisions, miscellaneous	113	126,557	18	215
Total collisions	1,680	$1,524,448	176	1,891
Derailments—				
Defects of roadway, etc.	220	165,698	9	170
Defects of equipment	434	351,710	7	109
Negligence of trainmen, signalmen, etc.	81	61,516	7	104
Unforeseen obstruction, etc.	58	75,353	12	65
Malicious obstruction of track, etc.	15	22,490	2	17
Other causes	271	260,841	32	180
Total derailments	1,079	937,608	69	645
T'l collisions & derailments	2,759	2,462,056	245	2,536

The table of prominent train accidents, given below, is made on very nearly the same basis that was adopted in Bulletin No. 5, namely: To include (*a*) all cases in which the damage is reported at $10,000 or over; (*b*) notable cases in which passengers are killed, and (*c*) cases doing damage less than $10,000, and down to $2,000, wherever the circumstances or the cause may be of particular interest. The number in the $10,000 class —17—is the same as in Bulletin No. 5.

The most disastrous one (No. 50) has already been referred to. Four of these accidents were due wholly or chiefly to an engineman's falling asleep, and in three others the men at fault had been on duty very long hours. In three cases (Items 3, 10 and 13) there was a lack of experience. Items 5, 6, 22 and 25 indicate very defective discipline or training. Item 31 seems to indicate a moral deficiency.

It is well recognized that the block-system or space-interval method of regulating the movement of railroad trains, the method that is required by law throughout Great Britain and Ireland, is a safer method than the time interval; and the fact has been touched upon in the annual reports of the Commission as well as in these bulletins. The records of the causes of rear collisions, which have been published, tend strongly to confirm this. At the same time it is everywhere understood that the block system itself depends on adequate care and discipline, and that defects in administration or inspection, or in apparatus, or negligence of enginemen or signalmen, sometimes lead to collisions where the block system is used. The fact that two or more serious collisions in the quarter under review occurred through failures of this kind, emphasizes this matter, and a list has therefore been made of all the collisions occurring in this quarter which fall within this class. The list follows on the next page.

This list includes only those cases where the absolute block system was in use, or where it appears to have been the intention to have it in use. In addition to these, the reports show a number of collisions due to a lack of care in regulating the speed where a permissive block signal had been given. The train had entered a block section under a signal indicating that the section was occupied by a preceding train, and that, according to the rule, the speed should be regulated so as to avoid running into the train ahead.

There are also numerous collisions where the report makes no mention of the block system, but which occurred on lines of railroad that are supposed to be worked under the block system; many or all of these are, no

CAUSES OF THIRTY-FOUR PROMINENT TRAIN ACCIDENTS.

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscelloneous trains.]

Item.	Record No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars and roadway.	Cause.
1	15	R.	F. and F...	2	0	$994	Local freight standing at station; 12 hrs. late; no flag out; weather foggy; men on duty 25 hrs. 30 min.
2	67	D.	F.....	0	1	319	Derailing switch; engineman asleep; he had been off duty 14 hrs., but had attended a funeral instead of taking rest.
3	2	R.	P. and F...	0	3	2,166	Flagman failed to go back far enough; a man of 7 months' experience, but only 2 weeks' experience on this division.
4	66	D.	F.....	1	0	2,240	Derailing switch; engineman asleep; he was killed.
5	10	B.	F. and F...	2	5	3,000	Engineman saw a "dead" engine on side track and by mistake took it for the head of a train which he was to meet.
6	24	M.	F. and F...	0	0	3,900	Crossing collision; engineman "lost his bearings;" on duty 17 hrs.
7	32	R.	P. and F...	2	8	4,000	Train switching on main track during dense fog; flagging neglected; conductor and engineman on duty 23 hrs.
8	57	B.	F. and F...	0	1	4,050	Engineman fell asleep; on duty 8 hrs. succeeding 12 hrs. rest. Fireman (14 months' experience) also at fault.
9	11	M.	P. and F...	2	17	4,372	Crossing collision; no fixed signals; trainman (experienced) neglected to flag. The killed were passengers.
10	3	R.	P. and F...	2	2	5,175	Flagman went back, but failed to signal the oncoming train; seems to have thought his train had gone on to the other main track; a man of 3 months' experience.
11	44	D.	P.....	0	14	5,224	Broken rail; internal flaw; speed of train, 70 miles an hour; weight of engine, 93 tons; rails, 80 lbs. per yd., nearly new.
12	38	B.	F. and F...	0	2	6,000	Telegraph wire broken; despatcher sent order by roundabout telephone line, but neglected to issue duplicate order on his own side of the break; a man of 3 weeks' experience at this point, but with a good record on other roads.
13	55	B.	F. and F...	1	1	6,700	Operator failed to deliver order, and failed to notify despatcher; conductor and engineman failed to get clearance card; despatcher failed to note lack of signature to order. Operator's experience 3 years, but in this place only 3 days; despatcher, 6 months' experience at this point; several years elsewhere.
14	50	R.	P. and P...	27	15	6,889	Engineman did not heed red light. (See text.)
15	37	B.	P. and F...	1	8	7,000	Occurred at 5 o'clock, foggy morning; brakeman with red light failed to stop passenger train; had no torpedoes; did not think to throw lantern into cab. Conductor and engineman held responsible for not having provided torpedoes.
16	1	R.	P. and P...	1	28	9,000	Engineman disregarded distant signal indicating "caution;" man of good record and experience; weather clear; signal equipment complete.
17	36	B.	P. and F...	0	18	9,980	Operator failed to deliver meeting order; cleared signal (ignoring presence of order) only 21 min. after he had received it.
18	52	R.	F. and F...	0	0	10,000	Runaway train on steep grade; engineman did not promptly give adequate signal for hand-brakes when air-brakes seemed to fail.
19	48	D.	P.....	1	7	10,600	Switch misplaced; left so by section foreman; experienced and with a good record.
20	51	R.	F. and F...	0	0	10,800	Runaway train on steep grade; conductor and 3 trainmen neglected to promptly use hand-brakes; 40 cars in train; air-brakes in use on 25.
21	6	R.	F. and F...	1	0	11,350	Train passed automatic block signal indicating "stop." Engineman was asleep and fireman neglected to observe signals. Engineman and fireman of the second of 2 engines drawing the train failed to detect the error, though rule required leading engineman to sound the whistle at each block signal.
22	40	B.	F. and F...	0	5	12,400	Conductor took the word of some unknown person, hidden from him by a car, that the opposing train had arrived, when it had not; engineman took conductor's word.
23	69	D.	P.....	1	8	12,430	Derailment, due to malicious removal of rail near trestle bridge.
24	72	D.	F.....	1	2	12,500	Runaway train on steep grade; rails wet or coated with sleet; 34 cars in train; 9 cars equipped with air-brakes; "hand-brakes always used on this grade."
25	58	B.	F. and F...	1	5	12,600	11:40 p. m.; engineman lost his location; experience 15 years, but in service on this division only 4½ months.
26	56	B.	F. and F...	7	0	13,838	Conductor and engineman of northbound train overlooked orders.
27	19	B.	F. and F...	2	2	13,962	Conductor and engineman forgot orders.
28	25	M.	F. and F...	1	2	15,957	Runaway cars; brakeman (in yard) failed to set brakes.
29	30	D.	F.....	0	0	17,000	Open draw; draw properly signaled; engineman of 17 years' experience, on duty 4 hrs.
30	22	M.	P. and F...	2	2	17,800	Freight train broke in two; rear portion collided with front portion, passenger train on adjacent main track ran into wreck.
31	9	B.	P. and P...	1	27	20,651	Occurred near same place as No. 19 (above). Operator failed to deliver order; told despatcher he had signature of conductor when conductor had not arrived. Appears to have confused two or more orders relating to different things. Operator 19 years old; in service of the company 3 years in different capacities.
32	7	B.	P. and P...	2	23	25,800	Conductor and engineman started on a run of several miles to reach a meeting station without allowing a reasonable and sufficient time. Both men reported as experienced and with good records.
33	21	M.	P. and F...	1	5	30,000	Collision of a train with a string of 7 freight cars which had run down from a side track. Brakes on these cars had been loosened "by some unknown miscreant."
34	71	D.	P.....	2	6	32,915	Passenger train derailed by accidental obstruction; wreck took fire and combustible portions were consumed. The obstruction was a platform car, which, standing on a side track, had been violently jammed by a freight train backing into the siding, and was crushed and pushed afoul of the main track.
			Total....	64	217	$361,612	

doubt, due chiefly to failure to obey the permissive rule, requiring speed to be kept strictly within control.

A third class of collisions, of which instances frequently occur, includes cases in, or at the approach to, a yard. Roads which ostensibly use the block system are found frequently, and perhaps usually, to report these collisions in precisely the same manner as they are reported by roads which do not use the block system. This appears to indicate that the block system proper is used in connection with, or is modified by, a rule requiring trains to be brought under control on the approach to a yard (usually to all yards or stations on a division); and the engineman is to do this without being warned by a block signal or by any fixed signal.

It is matter for deep regret that again the number of coupling accidents reported is large as compared with the number for the preceding quarter, and very large as compared with the corresponding quarter of 1901. It is quite possible that the reports made by the railroad companies for the first few months of the operation of the accident-report law were incomplete. In the matter of collisions, and to some extent as regards other accidents, it was found that some roads had deliberately omitted from their reports certain accidents which, when their attention was called to the fact, they said they understood could be rightfully omitted, because the train affected was engaged in traffic wholly intrastate. It was claimed that such traffic was not subject to a Federal law. Care was taken to correct this erroneous view, and the accidents in question were included in supplemental reports.

Rear Collisions on Railroads Where the Block System Is in Use.

Item.	Class.*	Cause.
a	1	Engineman ran past home and distant automatic signal standing against him; weather clear; engineman's record good.
b	2	Tower man "claimed" had authority from the station in rear to give clear block.
c	3	Engineman and fireman failed to see signal.
d	3	Engineman and fireman failed to see signal.
e	2	Ran past "red block."
f	3	Operator gave false clear signal; 2 employees killed.
g	3	Operator gave false clear signal; experience, 10 months.
h	3	Engineman of switching freight disregarded automatic block signal (on 6-track line). Trains on three tracks were damaged.
i	3	Signal man wrongfully gave clear block signal.
j	3	Automatic signal against the train; engineman failed to proceed cautiously.
k	3	Operator wrongfully gave clear signal.
l	1	Operator wrongfully cleared block signal; experience, 11 months.
m	1	Automatic block signal—designed to turn from clear to "danger" immediately before engine reaches it. In this case there was a blinding snowstorm and the engineman assumed that the signal light (6:15 p. m.) showing red, was turned to red by his engine, but he did not see it move, and it was, in fact, motionless, having been set at "danger" by the preceding train. An error of judgment as to brake power, after he saw the tail lights of the preceding train, also contributed to the accident.
n	1	Occurred 11 p. m.; fast passenger train; 12 persons injured. Engineman disregarded automatic block signal; appears to have governed himself by the indication of another block signal, adjacent, not pertaining to the track on which he was running.
o	2	Incomplete report.
p	3	Engineman ran past automatic block signal indicating "stop." He had worked long and irregular hours, viz.: On duty 8¾ hrs., off 1¾ hrs., on 14, off 4½, on 9¼, off 4¾, on 3 hrs. (at time of accident).

*Class 1 includes cases where both trains are passenger trains; Class 2, a freight train and a passenger train; Class 3, both freight.

It is probable, however, that many such cases were never discovered. A company which has omitted collisions and subsequently corrects its practice in this respect will, presumably, correct its practice in regard to reporting coupling accidents, though at the same time it may not go back and revise its reports of those classes of accidents concerning which the Commission has made no complaint.

The amendment to the safety-appliance law, which was passed at the last session of Congress, will correct erroneous views held by many railroad officers as to what trains and train operations are and what are not subject to a Federal regulating statute. This law deals only with couplers and air-brakes, but the principle laid down—that a Federal law regulating interstate commerce affects all of the train and car movements on a railroad line over which interstate shipments are carried or interstate passengers travel—is of wider application; particularly when the purpose of Congress is to obtain information.

The increase in the number of coupling accidents is undoubtedly to be accounted for largely and perhaps chiefly by the enormous increase in freight traffic and the consequent necessity of employing additional men. This fact was mentioned in the last bulletin. New men ought to be at first employed at such places and in such departments of the work as are the least dangerous to those who are inexperienced; but, in the stress of work occasioned by the congestion of coal traffic and by blockades at many places this rule has evidently been ignored. This tends to increase the number of casualties. The increase in freight traffic, putting unusual burdens on all departments of train and yard work, including the department of car inspection, also results, no doubt, in a less efficient condition of cars. Couplers and other parts are not so well cared for and maintained.

It is also to be noted that the swelling of the accident records by reason of the inexperience of new men may, and probably does, go on after the increase in the volume of traffic has reached its climax; for the enlargement of the number of train crews, yard crews, etc., has usually been inadequate at best. It has been observed that certain companies have engaged new men as fast as practicable, and in every way have striven to provide forces adequate to perform the work; but that these efforts were only partly successful, as is evident from the constant pressure on all the trainmen, old and new, to work as many hours daily as possible. It has therefore been necessary to continue adding new men after the capacity of the railroad and of its stock of locomotives and cars has been fully taxed and the increase in tonnage therefore stopped.

It will be observed that other accidents to trainmen have also increased largely, so that there is no ground (other than the lack of perfect maintenance due to congested traffic before referred to) for assuming that the coupling accident record indicates any increase in the risks or dangers of coupling work, or any change for the worse in the condition or quality of couplers.

The law just passed by Congress (March 2, 1903,) facilitating in a marked degree the enforcement of the safety-appliance act, and putting engines, cabooses, and cars—all vehicles in ordinary railroad traffic—on a uniform basis as regards this act, will, it is confidently believed, produce a decided improvement in conditions.

The Bulletin contains the usual table showing in detail, under 19 heads, the causes of the accidents to employees in coupling and uncoupling cars; and, in addition, there is a supplementary table in which the accidents occurring while using *uncoupling mechanisms* are analyzed still further. This supplementary table shows seven persons killed and 273 injured, a total of 280 casualties, caused as follows: Lifting locking pin, or block, with hand, 63; lift chain missing, 1; lift lever missing, 3; broken lever, 11; broken chain, 32; defective lever, 28; defective chain, 23; caught between car and lever, 61; caught between next car and lever, 36; lever on wrong side, 6; struck by lever, 5; caught finger in chain, 1; running alongside moving cars while switching, and holding up lever, 10.

A copy of the amendment to the Safety Appliance Law, requiring automatic couplers and grab irons on locomotives, etc., and requiring 50 per cent. of the cars in all trains to be air-braked, is appended to this bulletin.

The Metropolitan Railroad of Paris.

When the "Chemin de Fer Metropolitain" is finished, Paris will have 53 miles of underground railroad, or two and one-half times the number of miles covered by the underground lines of New York. Eleven miles of the Paris system are already in operation, and thirteen more are under construction and nearly ready for use.

The road has been a success from the start, and has given great satisfaction to the public. The rapidly increasing traffic has necessitated a 2½ minute service during the busy hours of the day, and even this is at times insufficient. The number of tickets issued in 1902 over the 11 miles worked was 62,114,930, and the gross receipts for that period, $2,152,335. The ratio of expenses to gross receipts was 43 per cent.

Negotiations in regard to the Paris underground system were started in November, 1895. French law prescribes eleven steps in the process of obtaining a city railroad concession in Paris, and two years is the average time occupied. The presidential decree granting a concession to the Metropolitan was signed in March, 1898. A long discussion followed as to whether the Metropolitan should be considered a state railroad or a local line. As the former, it would have been under the exclusive control of the Government, but the concession was finally obtained from the city, giving it a distinctly municipal character.

The terms of the concession required the operating company to furnish track, rolling stock and generating station, and the city to meet the expense of construction work, for which the Government authorized a loan of $33,000,000. The cost of the lines completed to date has been about $965,000 a mile for construction, and half that sum a mile for the other work. The average cost of the subway part figures out at $298 a yard, while the cost of the viaducts was $673 a yard, or a little more than twice as much. The relative cost of different styles of construction may be further examined by the aid of the following averages (per lineal yard):

Double track tunnel tangent	$212
Double track tunnel curves of 164 ft. and 328 ft. rad.	216
Single track tunnel	129
Cut and cover under main streets	435
Cut and cover under cross streets	348
Vaulted stations	544
Stations with metal roof	725

Over a few sections of the system where streets dip more than usual the tracks emerge to become surface and elevated lines.

The system is equipped with Hall automatic signals. The mode of traction is by electric motor cars and third rail, with continuous current distributed at 550 volts. Trains usually consist of four or eight cars. Four-car trains have one motor car and three trailers, and eight-car trains are made up of six trailers with a motor car at each end.

The fares, which are uniform for any distance, are: First-class, 5 cents; second-class, 3 cents; second-class return tickets, issued before 9 a.m., 4 cents. In return for the privileges of the concession the city receives two cents from each first-class fare and one cent on each second-class ticket, or practically one-third of the gross receipts. The city's share will increase slightly according to a sliding scale after the number of passengers carried has reached 140,000,000.

The Subway Track of the Paris Metropolitan.

The following is a description of the underground track of the Metropolitan Railroad of Paris, as given by M. Raymond Godfernaux in the *Revue Generale des Chemins de fer.*

The rails are the T type shown in Fig. 1, weighing 105 lbs. per yard. The height is 5.9 in., thickness of

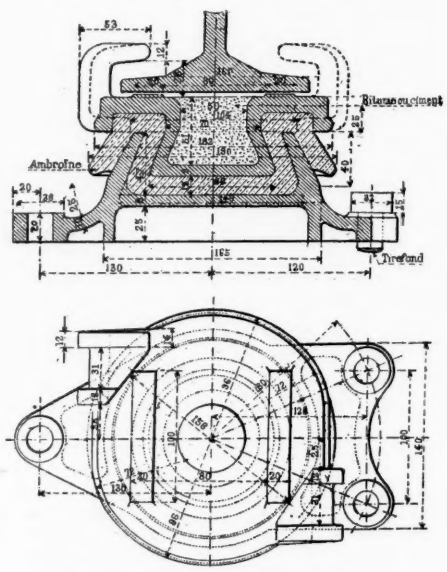


Fig. 5.—Insulation of Third Rail.

web 0.63 in., and width of head 2.56 in. The moment of resistance referred to the upper head is 16.67. The rails are 59 ft. long except on curves of 490 ft. or less radius, where the length is reduced to 29 ft. 6 in. The 59 ft. rails are laid on 20 ties spaced as shown in Fig. 2. Fig. 3 shows the arrangement of curves over 490 ft. radius, with 59 ft. rails, while the arrangement for curves of less radius with rails of 29 ft. 6 in. is shown in Fig. 4. The rail joints are made with angle fish plates 31.5 in. long held to the rail by six 1 in. bolts, and fastened to the ties each side of the joint by four wood screws. The ordinary ties are 7 ft. 2½ in. long, 8 in. wide and 5½ in. thick, while the ties carrying the third-rail have a length of 8 ft. 2½ in. In the tunnels the ties are oak, and on the elevated parts of the road they are creosoted beech. A strip of creosoted poplar 0.2 in. thick is let into the tie below the rail. The ballast of broken stone is level with the top of the ties, and extends to 8 in. below them.

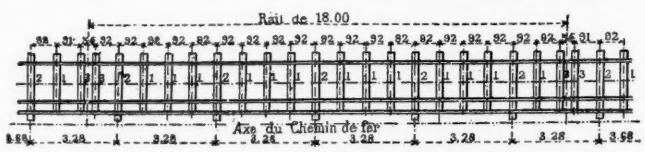


Fig. 2.

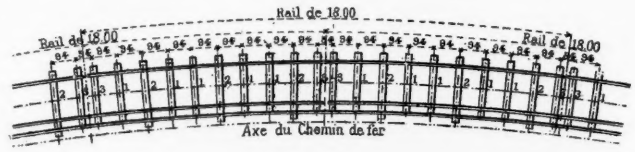


Fig. 3.

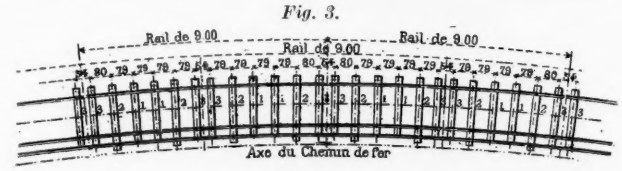


Fig. 4.

Standard Tie Spacing on Tangents and on Curves of Over 490 ft. Radius and of Less Than 490 ft. Radius.

The third rail, from which the current is taken, is

placed between the tracks, and is the same type as the other rails, but is of softer steel. On the tangents it is carried by insulators, as shown in Fig. 5, placed every 10 ft. and carried on the 9-ft. ties. Each insulator is made up of two iron castings with an insulating material

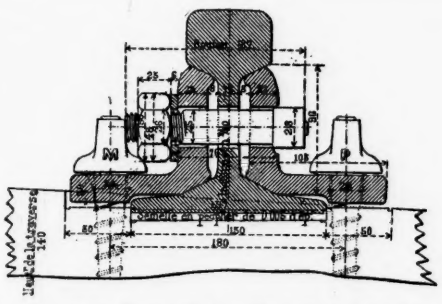


Fig. 1.—105-lb. Rail—Metropolitan Railroad of Paris.

(ambroine) between them. The joints are made with plain fish plates 36 in. long with two wedges 8 in. long and four bolts. The rails are bonded by four cables, each having a section of 0.31 sq. in., and made of braided copper wire, giving great flexibility. These cables have their ends inserted in holes drilled in the web of the rails, contact with the rail being assured by steel pins. The track rails are bonded by similar cables, having a section of 0.26 sq. in., attached to the foot of the rail, two on each side.

The Improved Symington Journal Box.

The causes of failure of journal boxes are given below:

First.—The box breaks open in the back, due to the dust guard seat of the axle striking a blow against the back walls of the box. In the M. C. B. journal boxes the width of the opening at the back is only ¼ in. larger than the diameter of the dust guard seat on the axle, and with wooden patterns and wooden core boxes the distance between the center stop lugs for holding the brasses in alignment is frequently from ⅛ in. to ¼ in. too wide, so that the thrust which should come on the center lugs of the boxes when the brakes are applied, comes directly against the back walls, which break out usually along the line A-A as shown. This weakness can be overcome by using metal core boxes, or by increasing the width of the opening in the back of the box ¼ in., or by internal ribbing in the box. To break the Symington box along this line A-A it is necessary to break through the ribs B and C, which take the strains.

Second.—The blow of the dust guard seat of the axle against the rear dust guard wall of the journal box, which occurs when there is sufficient lateral play, will cause failure along the line D-D. The strength in this design is increased at this point.

Third.—The pressure of the brass against the center side stop lugs in an emergency application of the brakes or in derailments is exerted against the flat side of the ordinary journal box, which is the weakest point. In this design the flat side wall of the box is reinforced by the ribs E, F, G and C. These ribs also hold the waste packing in place.

Fourth.—Journal boxes frequently break through the center on top. This is caused by the arch-bars being bent a little short, so that the weight comes upon the extreme outside edge of both top arch bar bolt lugs instead of directly over the brass. In this design the arch-bar bearing is dropped back sufficient to insure a perfectly flat bearing. The ordinary box is designed so that the arch-bar lugs will stand up under the weight of the car if the pressure should happen to come upon them, and, as the weight on these lugs is undesirable, they have been cut off, giving two vertical ribs down the flat sides of the box. This arrangement also facilitates the work when renewing the wheels, as it is only necessary to take out one bolt. With the rough construction in our trucks it is practically impossible to have both journal box bolts in contact with both arch-bar bolt holes and with both box bolt holes, and it frequently happens that with inside hung brakes the journal box bolt nearest the center of the truck takes the strain due to the application of the brakes, thereby putting this lug on the box in tension, whereas in the Symington box there is no metal in tension, as any pressure at right angles to the journal puts the top of the box in compression. Both bolts, of course, divide equally all strains parallel with the journal. The number of journal box bolts saved by having them so easily removable, and the reduction in time in changing wheels are important factors. There are many journal boxes in use with somewhat similar construction, but this design provides a necessary and desirable surface for the arch-bar, with suitable ribbing at the bottom to take care of the thrust both in line with and at right angles to the journal with the round bottom box. There is a slight reinforcement M in the bottom of the box in the center between the ribs extending out to the box bolts. This design also provides double stiffening ribs down the entire length of the flat sides.

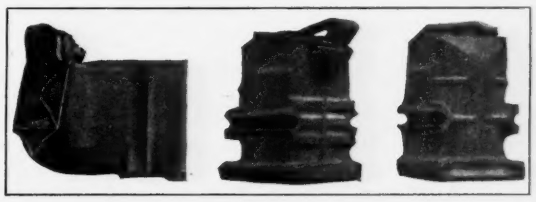
Fifth.—Mr. F. M. Whyte, Mechanical Engineer of the New York Central, noticed that the clearance between the inner dust guard wall H and the back of the brass was so small in the M. C. B. box that when any irregularities occurred in moulding the box or brass the entire thrust of the brass would come on this thin wall. These irregularities are overcome by the use of metal patterns and core boxes, but the clearance between the back of the brass and this inner wall is increased and the wall is dished ⅛ in. By dishing this wall and not cutting it away the strength of the back of the box is maintained.

Sixth.—The pressure of the jack against the botttom of the box will sometimes punch a hole or crack the bottom. To remedy this a jacking boss O is provided.

Seventh.—The hinge lug is sometimes knocked off, as the strain of the blow on this lug comes on the thin flat front edge of the roof of the box. In the Symington box the rib "S" dropped down from the roof, adds strength without interfering with the insertion of the brass and wedge.

Eighth.—Breakage is also caused by a blow on the front of the box, from some object too close to the track. Such a blow is taken by the heavy rib B on the corner of the box, also by the rib K across the front edge of the bottom. The ribs J which run into ribs C and F, reinforce the flat surfaces, and hold the packing in position.

Ninth.—Failure is due to the wheel wearing into the back wall, which finally breaks. As the front brass stop lugs in the box on one side of the car and the center stop lugs in the corresponding box on the same axle take this entire wheel thrust, it is impossible to get a blow on the back wall of the box. As the brass wears gradually down, the wheel comes closer to the box and gradually wears into the box, but it can never strike a blow that is not absorbed by the brass. Whenever the brasses are renewed on account of end wear on either side of the



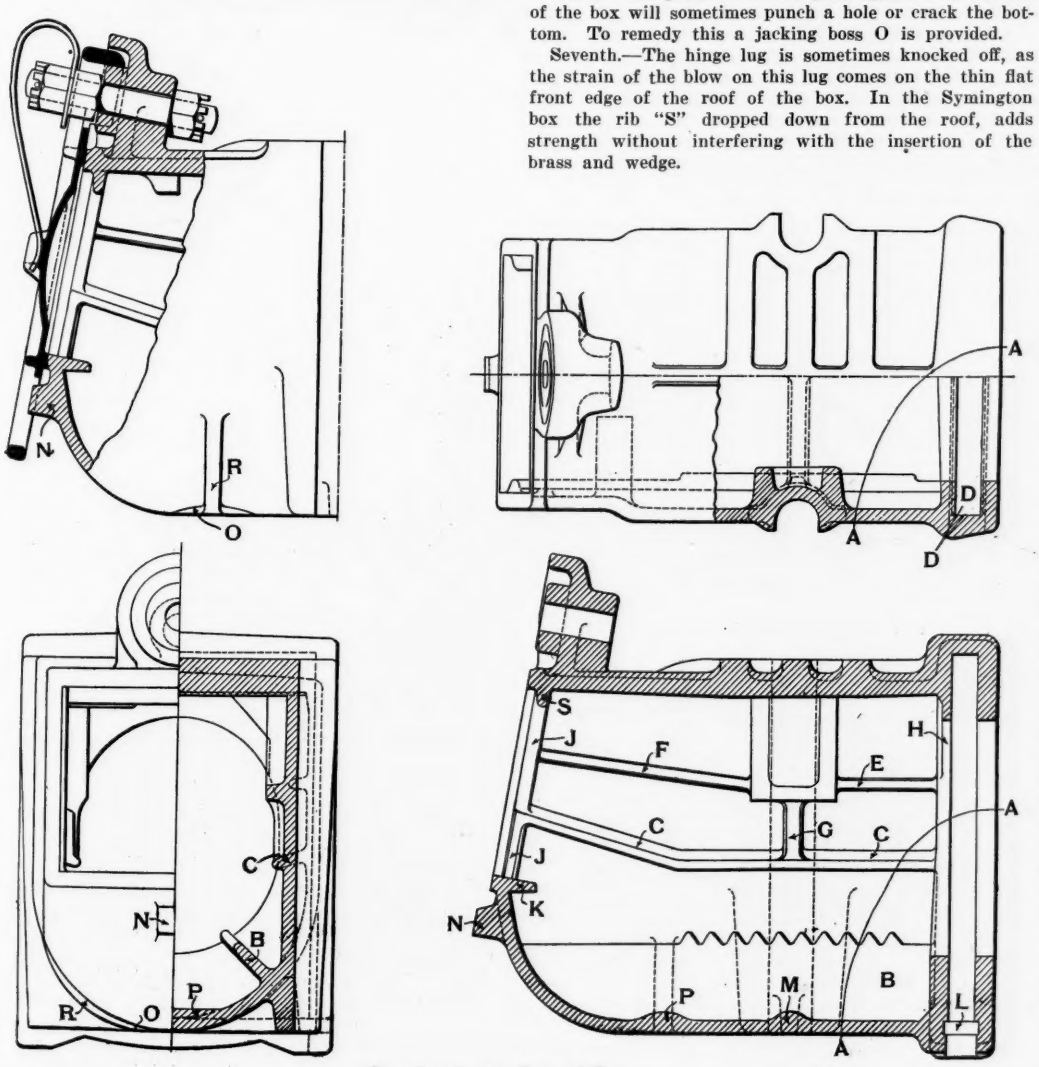
The Symington Journal Box.

car the wheel is held away from the back of the boxes until the end wear develops in the new brass.

A new feature is the sloping up of the rib C in front, to brace the flat side wall and to prevent the packer putting waste above this rib. The packing cannot come within 2 in. of the bottom of the brass in this design. The bottom ribs prevent any of the packing from rolling.

The dust guard is put into position from the bottom and a piece of wood is driven through the channel L from one side of the box to the other. A new method of locking the nuts on the spring bolt is used as shown. The joint on the box and the joint on the malleable lid are machined on a special milling machine so that a good joint is obtained. The entire pressure—about 100 lbs.—of the spring is on the center of the lid. To open the lid it is lifted over the tit N and swung around, giving a full opening.

The wear in soft high grade malleable iron boxes of the arch-bar type is noticeable in the brass stop lugs, due to the chafing caused by the slight incessant movement of the brass, also to the wear between the back of the box and the hub of the hard cast-iron wheel, and this wear cannot be eliminated. These boxes are made of mogul metal, a cross between cast-iron and high grade malleable iron.



The Symington Journal Box.

Hollow Pressed Axles.*

BY CAMILLE MERCADER.

In order to produce, by pressing, an axle having varying diameters, the following method was proposed by the writer: A rolled round steel blank, uniformly heated, is inserted into a two-part die, having a matrix cavity in the form of a rough turned axle. The diameter of the journals is made equal to the smallest diameter of the axle in the center, which corresponds to the diameter of the round blank. After the dies are clamped about the heated round the latter is axially perforated simultaneously at both ends by two cylindrical punches, which force the metal of the blank to conform to the shape of the matrix die and fill out the same. The round is heated up to about 1,000 deg. C. and the total hydraulic pressure required for penetration with a punch of 3 in. diameter amounts to about 50 tons. During the last end of the stroke a total hydraulic pressure of about 150 tons is required because the blank loses its initial heat through contact with the dies and because the end collars upset, at which time the metal may flow back against the punch. The punch, being tapered, acts as a wedge and the pressure that can be exerted upon the axle blank is consequently enormous.

This great compression improves the quality of the steel in the central part of the axle by destroying the injurious effects of segregation and piping usually found in ingot steel. It is absolutely necessary to have the greatest uniformity throughout the body of the blank, the temperature determining the resistance which the punch must overcome.

The experiments performed at Homestead gave evidence that the lowest limit of temperature for successful punching was reached at about 850 deg. C., as near as could be judged. At this temperature the punch entered with difficulty, requiring about 250 tons initial pressure and about 500 tons final pressure for upsetting the collars; the metal, however, filled out the die very nicely, producing a fair looking axle. At a temperature of about 950 deg. C. the pressure required at the end of the stroke amounted to about 250 tons, and at about 1,050 deg. C. a pressure of about 150 tons was found to be sufficient.

In testing these axles Pennsylvania Railroad drop test specifications were followed—viz., seven blows at 43 ft. of 1,640 lbs. weight, striking midway between supports 3 ft. apart; axles to be turned over after every other blow. The axles, having stood this test, were subjected

*Extracts from a paper read at the May meeting of the Iron and Steel Institute.

to further blows until destruction, with results as follows:

"A."—Axle Blank Punched at 850 deg. C.

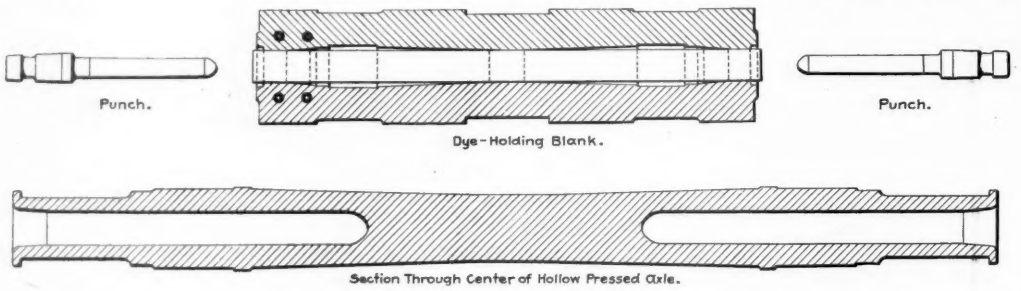
Weight of axle, 710 lbs.; diameter of center, 5⅞ in.; size of journals, 5½ in. Broke in center at 72nd blow. The steel had the following analysis: Carbon, 0.39 per cent.; phosphorus, 0.024 per cent.; manganese, 0.47 per cent.; sulphur, 0.026 per cent.

"B."—Axle Blank Punched at 950 deg. C.

Weight of axle, 705 lbs. Dimensions of axle same as before. Broke in center at 56th blow. Axle turned after each blow. The steel had the following analysis: Carbon, 0.48 per cent.; phosphorus, 0.02 per cent.; manganese, 0.50 per cent.; sulphur, 0.02 per cent.

"C."—Axle Blank Punched at 1,050 deg. C.

Weight of axle, 700 lbs. Dimensions of axle same as before. Axle was turned over after every other blow. Broke in center at 37th blow. The analysis of the steel



Hollow Pressed Steel Axle.

was: Carbon, 0.54 per cent.; manganese, 0.67 per cent.; phosphorus, 0.03 per cent. The steel was too hard, having an excess percentage of carbon and manganese. After rupture, which occurred at the center, the two halves of the axle were weighed and the difference in weight was only 2 lbs., demonstrating the exactness of the shape and the uniform compression throughout the axle.

With the experimental plant erected in Homestead, the time required to make one axle, by this process, all operations included, did not exceed two minutes. Allowing, again, two minutes for cleaning and black leading the dies and for cooling and capping the punches, the capacity of one press will be 15 axles per hour, or 300 axles, 5½ x 10 in. journal, per 20 hours, which is fully three times the quantity accomplished with one hammer by the best American practice. The number of men required to operate the press remains the same as needed at the hammer to forge five 5½ x 10 in. journal axles per hour. The machine is effective in construction and produces a strong and light axle which contains the combination desired, minimum weight and maximum strength.

Axles thus made have more resiliency than the present type, and are not, therefore, liable to fracture from sudden strains. Their use in railroad car construction results directly in material economy, not only over solid axles, but over any other species of hollow axles.

The advantages of a hollow pressed axle may be summarized as follows:

1. The axle has a perfect form; its shape can be best adapted to resist the strain to which it is subjected with the least amount of metal, combining minimum weight with maximum strength.

2. The forging effect being carried out throughout the material, both internally and externally, the material is found to be far more homogeneous than solid axles made in the usual manner, segregation is destroyed, and, consequently, the axle is much more reliable.

3. The journals, being highly compressed, will in finishing attain a more highly polished surface, thereby minimizing the friction, resulting in economy of draft.

4. The journals, being hollow, will remain cooler and permit the storage of a considerable quantity of oil, removing herewith the chief cause of hot journals, also economizing materially in the expenditure for lubrication.

5. No straightening after punching is required, the axle being as straight as the die, thereby eliminating entirely the injurious effects of the gagging operation.

6. No centering, no cutting of the ends, no rough turning is required, thereby saving considerably in finishing labor and increasing the finishing capacity of existing plants.

7. The punching of treble the amount of axles as compared with forging with an equal number of hands, resulting in saving of forging labor.

8. Considerable saving in steam consumption and fuel.

9. The detection of a defective axle without performing any extra work—that is, without the necessity of rough turning it over all, which provision is now included in the latest M. C. B. specifications.

10. Approximately uniform fiber stresses throughout the body of the axle, due to the straight and uniform taper between the wheel seats.

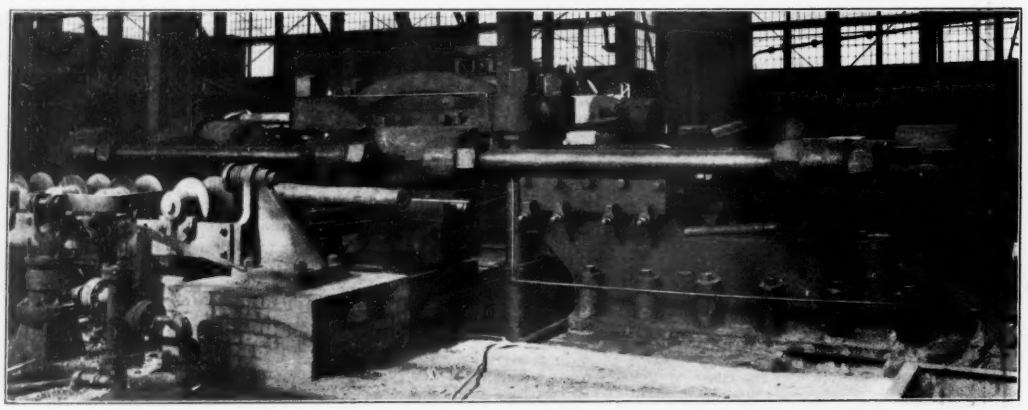
11. A saving of 33 per cent. of steel in the manufacture.

12. Present drop test specifications need not be changed.

13. The possibility of supplying uniform axles, limiting the weights and dimensions to a minimum.

14. The weight of a 100,000 lbs. capacity steel car is decreased by 1.7 per cent., permitting this load, which amounts to 24,000 lbs. in a train of 40 steel cars, to be carried without any additional expenditure of energy. Converting this advantage into other channels, there would be a corresponding saving in coal consumption or tractive power.

The system is, of course, easily adaptable for the smaller sizes of axles, with a corresponding decrease in the cost of installation.



Hollow Axle Hydraulic Press—Carnegie Steel Co., Homestead, Pa.

The Year's Traffic at Sault Ste. Marie.

Mr. Joseph Ripley, General Superintendent of the St. Mary's Falls Canal, submits the following annual report of traffic through the United States and Canadian canals at Sault Ste. Marie for the season of 1902. The more important and interesting figures follow.

The total freight traffic in 1901 was 28,403,065 net tons, and in 1902 was 35,961,146 net tons. This exceeds the traffic of the preceding year by 7,558,080 tons, or 27 per cent., which is the largest yearly gain ever reported in amount, although not in percentage, being 3,536,935 tons more than the largest previous yearly increase in 1899, and 12 per cent. less than the 39 per cent. increase in 1886. The increased tonnage was for all items of freight except hard coal, building stone, salt and manufactured iron.

The season of navigation was eight months and 20 days, 12 days longer than last year. The American Canal passed 31,232,795 net tons of freight, an increase of 5,650,757 tons, or 22 per cent.; the number of passengers was 22,778, a decrease of 6,923, or 23 per cent., as compared with the season of 1901. The Canadian Canal passed 4,728,351 net tons of freight, an increase of 1,907,324 tons, or 68 per cent.; the number of passengers was 36,599, an increase of 6,637, or 22 per cent., as compared with 1901. The total number of vessels passing through both canals numbered 22,659, showing a yearly gain of 2,618 passengers, or 13 per cent., as compared with the 20,041 passengers in 1901. The total lockages numbered 12,846, showing a yearly gain of 1,525 lockages, or 13 per cent. The depth of water in the entrance channels through canals and locks permit a draft of 17½ to 19 ft. Forty-five large freighters were put in commission during the year, ranging from 225 ft. to 436 ft. long, and designed with a speed of 12 miles an hour. The growth of the Lake Superior traffic during the year has been phenomenal. The estimate of amount of freight carried, etc., follows:

EAST AND WESTBOUND COMMERCE FOR THE SEASON OF 1902.

Articles.	U. S. Canal.	Can. Canal.	Total.
Eastbound.			
Copper, net tons	106,459	14,153	120,612
Grain, bushels	21,650,549	6,075,493	27,726,042
B'dg stone, net tons	37,064	1,855	38,919
Flour, barrels	6,072,295	2,837,710	8,910,005
Iron ore, net tons	21,796,348	2,481,207	24,277,555
Iron, pig, net tons	11,863	1,531	13,394
Lumber, M. ft. B. M.	1,028,848	62,623	1,091,471
Silver ore, net tons	1	...	1
Wheat, bushels	48,835,062	27,895,903	76,730,965
Gen. mdse., net tons	49,121	73,127	122,248
Passengers, number	10,869	19,897	30,766
Westbound.			
Coal, hard, net tons	284,986	24,962	309,948
Coal, soft, net tons	3,973,448	529,082	4,502,530
Flour, barrels	...	235	235
Grain, bushels	60	14,720	14,780
Mfd. iron, net tons	142,803	41,955	184,758
Salt, barrels	283,410	159,896	443,306
Gen. mdse., net tons	455,489	162,363	617,852
Passengers, number	11,909	16,702	28,611
Freight—			
Eastbound, net tons	26,331,559	3,944,430	30,275,989
Westbound, net tons	4,901,236	783,921	5,685,157
T'l freight, net tons.	31,232,795	4,728,351	35,961,146
Vessel passages	17,588	5,071	22,659
Regis'd tonnage, net tons	27,408,021	4,547,561	31,955,582

FREIGHT TO AND FROM EACH LAKE.

Eastbound.	
From Lake Superior ports to—	Net tons.
Lake Michigan ports	3,334,952
Lake Huron ports	1,412,434
Lake Erie ports	25,247,132
Lake Ontario ports	281,471
Total	30,275,989
Westbound.	
To Lake Superior ports from—	
Lake Michigan ports	104,027
Lake Huron ports	200,838
Lake Erie ports	5,346,410
Lake Ontario ports	33,882
Total	5,685,157

Total Freight, Its Valuation, Cost of Transportation, Average Length of Trip and Rate Per Ton Per Mile.

Year.	Total freight, net tons.	Valuation of freight.	Freight charges.	Av. haul. Miles.	Freight charges, per mile, ton. Mills.
1887	5,494,649	$79,031,757	$10,075,153	811.	2.3
1888	6,411,423	82,156,019	7,883,077	806.	1.5
1889	7,516,022	83,732,527	8,634,246	790.	1.5
1890	9,041,213	102,214,948	9,472,214	797.	1.3
1891	8,888,759	128,178,208	9,849,022	820.	1.35
1892	11,214,333	135,117,267	12,072,850	822.	1.31
1893	10,796,572	145,436,957	9,957,483	831.	1.1
1894	13,195,860	143,114,502	10,798,310	821.	.99
1895	15,062,580	159,575,129	14,238,758	830.	1.14
1896	16,239,061	195,146,842	13,511,615	836.	.99
1897	18,982,755	218,235,927	13,220,099	841.	.83
1898	21,234,664	233,069,740	14,125,896	842.	.79
1899	25,255,810	281,364,750	21,959,707	827.	1.05
1900	25,643,073	267,041,959	24,953,314	825.	1.18
1901	28,403,065	289,906,865	23,217,974	823.	.99
1902	35,961,146	358,306,300	26,566,189	827.	.89

American vessels carried 96 per cent. of the total freight and 28 per cent. of the total passengers. Of the 22,659 passages for the season, 3,468 were by 90 vessels under 100 tons register, with an average register of 36 tons each. The total freight carried by such craft amounted to 1,356 net tons.

Individual Maximum Records Made by Vessels During the Season.

Name of vessel.	Maximum.	Amount.	Owners.
Str. Isaac L. Ellwood	Single cargo, net tons	8,441	Pittsburg S. S. Co.
Barge John Smeaton	Single cargo, net tons	8,485	Pittsburg S. S. Co.
Str. Wm. Edenborn	T'l cargoes, net tons	183,270	Pittsburg S. S. Co.
Str. Troy	Miles run	45,340	N. Y. C. & H. R. R.
Str. Wm. Edenborn	Mile-tons	158,858,138	Pittsburg S. S. Co.

The maximum traffic for a single day was on August 14, when 253,370 freight tons were passed through the canals by 127 vessels, whose registered tonnage amounted to 197,633 tons. The minimum traffic for a single day was on December 17, when no freight passed through the canals, although four vessels were locked through, whose registered tonnage amounted to 12 tons.

General Summary.

For American and Canadian Canals together.
(All tons are net tons of 2,000 pounds.)

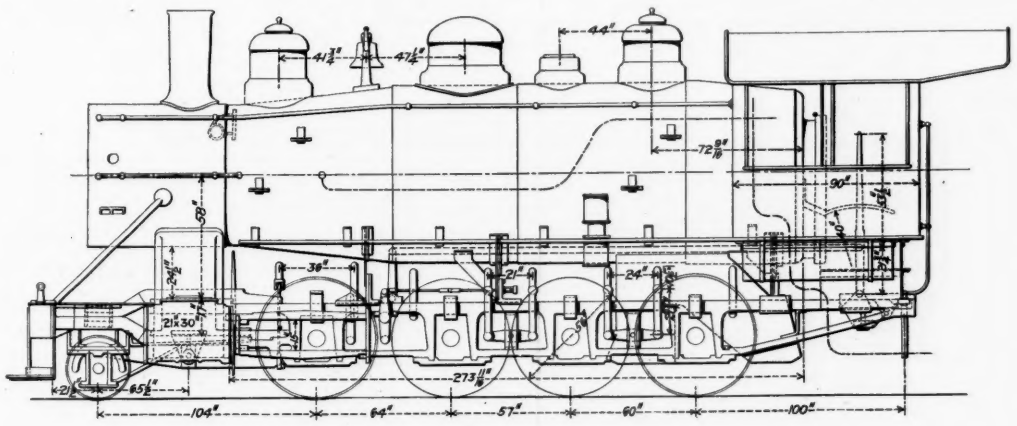
Total mile-tons	29,755,916,637
Total freight carried, tons	35,961,146
Total valuation placed on freight carried	$358,306,300
Average value per ton of freight carried	$9.96
Total amount paid for freight transportation	$26,566,189.40
Average distance freight was carried, miles	827.4
Cost per mile per ton, mills	.89
Average cost per ton for freight transportation	$0.74
Total number of registered vessels using canals	935
Total number of passages by unregistered crafts carrying freight	490
Time American canal was operated, days	256
Time Canadian canal was operated, days	264
Total valuation placed on registered vessels	$70,997,400
Total number of passengers transported	59,377
Freight carried by—	
Registered vessels, tons	35,896,298
Unregistered vessels, tons	64,848
American vessels, per cent	96
Canadian vessels, per cent	4
Passengers carried by—	
American vessels, per cent	28
Canadian vessels, per cent	72

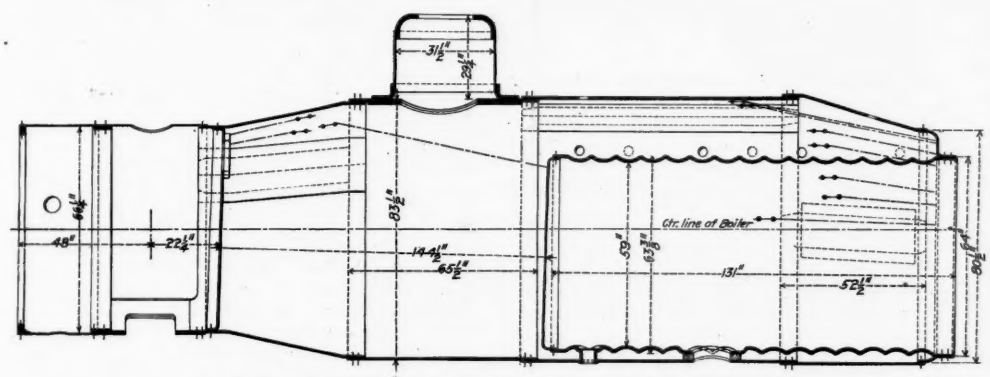
Consolidation (2-8-0) Locomotives for the South Buffalo Railway.

The Baldwin Locomotive Works is building two consolidation (2-8-0) locomotives for the South Buffalo Railway Company. As will be seen from the accompanying engravings, the boiler is the Vanderbilt type. The engines are designed for road service and will be used exclusively in handling the heavy freight traffic which passes over this short but hilly road. The road is seven miles long and extends from Seneca to the Buffalo Creek Railroad (a switching road in Buffalo), and has connections with the B., R. & P., the Lackawanna and the Lake Shore.

The total weight of the engine is 175,000 lbs., with about 159,000 lbs. on the drivers, or, in other words, 91 per cent. of the total weight is available for tractive adhesion, which is an economical feature of the design. The total heating surface is 2,493 sq. ft., with 135 sq. ft. in the fire-box, and the grate area is 37.9 sq. ft. The cylinders are 21 in. x 30 in., and the working pressure is 200 lbs. per sq. in.

The engine is similar in many respects to a consolidation locomotive, with Vanderbilt boiler, for the B., R. & P., described in the *Railroad Gazette* Sept. 13, 1901. For





Consolidated (2-8-0) Locomotive—South Buffalo Railway.

the purpose of comparison, the principal dimensions of both engines are given below.

	South Buffalo.	B. R. & P.
Total weight, lbs.	175,000	169,600
Weight on drivers, lbs.	159,000	151,900
Diameter of drivers, in.	56	56
Cylinders, in.	21 x 30	22 x 28
Heating surface, sq. ft.	2,493	2,585
Grate area, sq. ft.	37.9	33
Working pressure, lbs. per sq. in.	190	200
Number of tubes	377	377
Length of tubes	12½ ft. ½ in.	12 ft. 6 in.

The new engine is somewhat heavier in total weight and weight on drivers than the B., R. & P. engine, but the heating surface of the South Buffalo engine is 92 sq. ft. less than that of the other locomotive. This difference is due to shortening the tubes by 5½ in. in the new machine.

Assuming that 85 per cent. of the boiler pressure is available at starting, the maximum tractive effort is about 38,000 lbs. The theoretical diagram of tractive effort based on the maximum boiler capacity of this engine is shown in Fig. 1. The curve A B C was calculated by the formula* proposed by Prof. Goss at the Master Mechanics Convention in 1901. The results obtained by the use of this equation have since been shown to closely approximate the maximum performance of locomotives in service. It will be noted that up to a speed of about 10 miles an hour, the maximum tractive effort, as determined by the cylinder power (and limited by the weight on drivers) is available. As the speed increases above 10 miles an hour the drawbar pull drops. Thus at 20 miles an hour the maximum pull is 19,000 lbs.; at 30 miles an hour, the pull is 12,000 lbs., and at 56 miles an hour, the pull drops to 5,000 lbs. At all speeds above 10 miles an hour, as noted above, the boiler is working at the same

*See *Railroad Gazette*, Jan. 17, 1902. $t = 161 \frac{H}{S} - \frac{d^2L}{D} 3.8 - W(2 + \frac{1}{3}S) - 11^2$. The first term of the above equation is based on the steam consumption and boiler power for a simple locomotive. The second term allows for the losses in the mechanism of the locomotive. The third term represents the rolling friction of locomotive and tender, and the last term is the air resistance at the head end.

maximum power and the drop in tractive effort aside from the mechanical losses is due to the fact that the product of the speed and drawbar pull is proportional to the horse-power developed. Hence if the power is constant and the speed increases, the pull must decrease in order that the product of the speed and pull should be a constant. Below 10 miles an hour the capacity of the boiler is not taxed to its limit, as the power developed from A to B is limited by the adhesion of the drivers.

It is also interesting to estimate the maximum speed that can be continuously maintained by this engine with a given load. By Wellington's formula the train resistance at starting is 15 lbs. per ton on a straight and level track. The maximum load which this engine can start by a steady pull is 38,000 divided by 15, or 2,533 tons. As the speed increases the train resistance drops until a speed of about 10 miles an hour is attained, from which point the resistance increases with the speed. Thus at five miles an hour the resistance per ton is 7 lbs.; at 10 miles the resistance is 5.5 lbs.; at 20 miles the resistance is 7 lbs., and at 60 miles the resistance is 17 lbs. The total resistance for a train of 2,533 tons, 1,000 tons and 333 tons respectively has been calculated for various speeds, and the results have been plotted on the diagram referred to above. The curve of total resistance (A B_1 C_1) for a train load of 2,533 tons crosses the curve of maximum power (A B C) at C_1. At this point the total resistance of the train exactly balances the maximum pull of the locomotive, and any effort to accelerate beyond this speed of 21 miles an hour results in the rapid exhaustion of the boiler until the speed again drops to the *critical* point. Similarly for a load of 1,000 tons, the critical speed is found at C_2, or about 33 miles an hour, while for a load

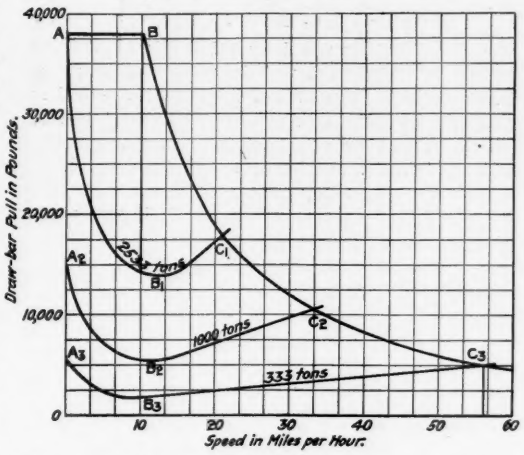


Fig. 1.—Relation Between Draw-bar Pull, Speed and Total Train Resistance—South Buffalo Consolidation.

of 333 tons the maximum speed is 56 miles an hour. These comparisons could be carried on indefinitely but in passing it is desired to call attention to the importance of ample steaming capacity where high speed service is desired. Referring again to the diagram, the area enclosed between the curve of maximum power and the curve of total train resistance (A B C_1 B_1 A) is proportional to the steaming capacity of the locomotive, while any vertical ordinate between these two curves (such as B B_1) represents the reserve power available for acceleration at the given speed.

Some of the typical ratios for the locomotive follow:

Wt. on drivers divided by maximum tractive effort	4.19
Wt. on drivers divided by total heating surface	63.8
Heating surface divided by grate area	65.7
Tube surface divided by fire-box heating surface	17.5
Htg. surface divided by cylinder volume (one side)	.215.
Grate area divided by cylinder volume (one side)	3.27

The tank is the Vanderbilt type and holds 4,000 gallons.

Railroading as a Career.

The *Minneapolis Tribune* prints answers to a series of questions which it sent to a number of railroad officers, asking expression of opinion as to the chance offered a young man in railroad work. The questions were as follows:

1. What are the present opportunities for young men in railroad life?
2. What effect does the tendency to consolidation in railroads have upon such employment?
3. In your opinion, what department of the railroad service gives best promise of success?
4. What kind of training will furnish the best preparation for success in railroad life?

The following answers, among others, were received:

President Roswell Miller, Chicago, Milwaukee & St. Paul—1. The present opportunities for young men are better than they have been. 2. It diminishes the number of employees needed. 3. The traffic department. 4. A young man should have a good education. When it is completed he should start at once in some branch of railroad life.

President W. H. Truesdale, Delaware, Lackawanna & Western—1. They are excellent and as good as they ever were for the right kind of young men. 2. None that I can observe. Good, reliable men are just as much in demand as ever. 3. Traffic. 4. A good common school education coupled with the right kind of home training and influence.

President E. T. Jeffrey, Denver & Rio Grande—1. Better than ever before for energetic, intelligent, temperate young men who will work hard and faithfully. 2. It has no material effect, but may broaden the field in large systems as compared with small ones. 3. The practical operating ones, such as mechanical, engineering and transportation. 4. A good public schooling supplemented by a course in a first class scientific or technical school.

Russell Harding, Third Vice-President and General Manager, Missouri Pacific—1. Never better or brighter. Those possessed of ambition and a desire by their efforts and application to succeed are bound to be recognized and pushed forward. 2. The tendency of young employees or officers is to push them forward; older officers caused to give way for young, energetic men. 3. I think the traffic department offers more opportunities than the transportation on account of the field being larger and having more really responsible positions and much more rapid promotion. 4. Ordinary business training where close application is required and responsibility borne; one must learn to act for himself.

F. D. Underwood, President of the Erie—1. Under certain conditions better than ever. 2. None. 3. Mechanical and transportation. 4. Such as will produce good health, quickness to observe, a mind that can be concentrated, mental and physical energy.

Edgar Van Etten, Second Vice-President, New York Central—1. For a young man wishing to work hard the opportunities in railway business are as good—no better—as in any other profession or business. 2. Naturally the total number employed will be reduced and a weeding process will ensue. Only another case of the "survival of the fittest." 3. There is no royal road to success. Hard, loyal and faithful work in any department will in time meet with reward. 4. If by training you mean education, would say a course in civil, mechanical or electrical engineering would be helpful. But it is the endeavor to work as well without supervision as with it, to be loyal and to act promptly which makes the successful man.

Austrian Railroad Statistics.

The following table of figures is summarized from the *Archiv für Eisenbahnwesen*, translated into American standards.

	1900.	1901.
Railroads owned by Government, miles	...	4,840
Railroads leased by Government, miles	...	378
R. Rs. owned by private corporations, miles	...	1,910
T'l R. Rs. in Austria (in operation), miles	6,980	7,128
Investment in Austrian railroads, millions	...	$504
Gross earnings, millions	...	$54.8
Operating expenses, millions	...	$44
Surplus, millions	...	$10.8
Int. earned on invest. (cost value) p. c.	2.06	2.09
Int. earned on invest. (pres't value), p. c.	2.13	2.15
Average earnings per ton-mile, cents	1.35	1.36
Average earnings per passenger-mile, cts.	0.875	0.875
Receipts from passenger service, per cent.	27.5	27.4
Receipts from personal bag. service, p. c.	1.3	1.2
Receipts from express service, per cent.	3.2	3.5
Receipts from freight service, per cent.	68	67.9
Receipts per mile from passenger service.	$2,530	$2,550
Receipts per mile from freight service	$6,240	$6,320
Density of Traffic—		
Passenger-miles per mile or railroad	289,780	291,770
Ton-miles per mile of railroad	464,000	464,000
Average tonnage of freight train, tons.	408	399
Length of av. trip of passengers, miles.	20.5	18.6
Length of average trip of freight, miles	78.3	77.5
Classification of Passenger Service—		
Trips up to 12½ miles, per cent	69.8	70.7
Trips up to 44 miles, per cent	22.1	21.4
Trips up to 125 miles, per cent	5.9	5.8
Trips up to 700 miles, per cent	2.2	2.1

The wireless telegraph between a moving train and a station has been successfully tried on the German Government Military Railroad between Berlin and Zossen. The Braun & Siemens system was used.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 83 Fulton Street, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The *Railroad Gazette*, as a preacher for many years of the gospel of the block system, records with mixed feelings the results of the practice which supposedly has followed the doctrines set forth in the preaching. Attention is called to the record of 16 rear collisions, in three months, on block-signaled railroads, which is published by the Interstate Commerce Commission this week. We read this record with shame; it shows what poor preachers we are. Both automatic and manual signaling figures in the record. Nine of the 16 collisions were due to disregard of automatic signals, which in every case warned the engineer to stop. There was no fault in the signals or in the regulations. These failures of automatic signals to stop trains simply show that strict obedience to them must be enforced. If any one thinks that the engineman who caused the Westfield disaster in January (this accident will come in the next bulletin), is exceptional, let him read this list of causes. The Westfield man was exceptional in that he had a very fast train, and neglected his lookout for a long time—probably from one to three minutes—but his conduct was the same in kind as that of many other runners. All of the 7 collisions reported under manual block-signaling appear to have been due to misconduct or neglect of signalmen. The lesson—plain as a pike staff before, but here to be seen in authentic statistics—is: (1), Automatic signals indicate danger ahead more certainly than the manual system. (2), Enginemen do not obey automatic signals as uniformly as they obey those operated by signalmen who can watch and report them. (3), Where automatic signals are used the discipline of the enginemen is the most vital feature of the whole problem. And it is the most critical, for disciplining enginemen is what the lawyers would call a continuing duty; it can never be done up and dropped out of mind.

The larger of the two tables in the bulletin, showing those collisions (and derailments) of all kinds which are classed as of the first importance, is full of interesting points, as usual. In this, as in the other table, the facts are so tersely stated that there is no room for condensation or editing; the reader must look at the tables themselves. Three cases will be found in which the men at fault had worked long hours, and four others in which enginemen were asleep in their cabs. On the face of the record, three of these last four delinquents had had sufficient rest before going to work, though of course no one finds out, in cases like these, whether the rest-period was in fact rightly used. In the fourth case, however, (Item No. 2), misuse of rest-time is plainly acknowledged. These facts furnish the evidence, if any were needed, to justify all that we said on April 10 about the need of effective measures to make enginemen (and their superiors) enforce a reasonable time for the "lay-off" in all train work. Items 3, 10, 12 and 13 in the large table also show once more the risk that is taken when inexperienced men are entrusted with grave responsibilities. While it is often easy to pick out a young man of 18, or even of 17, whom any superintendent would trust to do important telegraph or signaling work, it is a quite different thing to allow the employment everywhere and anywhere of persons under 21. In dealing with hundreds of signalmen and operators there must be a youth-limit, and there must be left some little "margin of safety" in fixing it. A superintendent ought to welcome a rigid rule by which he could guard against too easily yielding to the impulse to prematurely promote bright boys in his own office. The butting collision numbered 9 (31st item), appears to be the same that was commented on in the *Railroad Gazette* October 31. The Interstate Commerce Commission rightly characterizes as a moral delinquent an operator who deliberately telegraphs a conductor's signature to an order before the conductor has seen or even heard of it. It may be that, by precept or example, the operator in this case had been encouraged to thus play with dynamite—for that is what these little irregularities amount to in train despatching; but the fact indicates, nevertheless, a grave defect in practice; one which can only be corrected by the general application of that kind of rigid discipline which includes a rigid standard of honor all around. It is difficult to imagine an intelligent operator deceiving a despatcher, in a case like this, except with a wrong purpose. He must realize that he is deceiving and that his object is to disobey the despatcher. The despatcher who tolerates anything of this kind, thinking that he can, in spite of loose practice, maintain a discipline high enough to run trains safely, is laboring under a delusion even worse than the operator's.

The Union of the Engineering Societies.

The official announcement of a gift of a million dollars by Andrew Carnegie for an engineering building in New York City is possibly a matter of greater interest to the members of the national engineering societies throughout the country than to those who live in the city. Already, plans have been made for carrying out the project, and it is proposed to put up a magnificent building, to be the home of the national societies and the Engineers' Club. It only remains for the societies to appoint committees to join in building the house. The gift is a fitting recognition of the work and importance of the engineer, and is made doubly significant by the character of the giver; one whose life and fortunes have been so closely allied to the engineering profession.

It has long been the dream of many men to bring about such a local union, and while the present plan does not propose merging, it will be proper now to again consider the feasibility of a closer union. The qualifications, the aims, the ideals of the engineer are the same, whatever may be his prefix. In the words of the venerable iron master of Bethlehem—John Fritz—"no one society of engineers can claim that its members did it all; for it has all been accomplished by their united efforts;" and Fritz expresed the ardent hope that the different societies might become more closely associated, both on social and on engineering lines. The achievements of Watt, Stephenson, Kelvin, Brunel, Bessemer, and of many others on the roll of honor, have had their place in the upbuilding of modern civilization. The work of one would have been far less useful without the work of the other. The fundamental principles involved in the science of engineering are of unlimited application, and whether the man at the outset of his career specializes in one branch or another is largely the result of circumstance or environment. Ultimate success is no more certain in one branch than in another. An intimate knowledge of the three laws of motion and a clear conception of the conservation of energy, together with good common sense and judgment, constitute the most valuable assets of the engineer.

With a field so large, specialization is necessary; but the elements of success are in all branches the same. New fields are constantly opening. The electrical engineers, the youngest branch, have already sub-divided, and only recently an electro-chemical society has been formed. There are dangers, however, in specialization unless the aims and objects of the profession as a whole are clearly kept in mind.

The tendency of a general engineering society would be to offset the narrowing influences of over-specialization while the sum total of the good work performed by the independent organizations would be increased and the scope of the individual work would be broadened. No doubt difficulties would be encountered in consolidating, but the ends to be gained warrant the expenditure of time and study for its accomplishment. In any event, the erection of a union building, and the added availability of their several libraries, will do much to unify the kindred interests of engineers, and it will be a concrete reminder of the potent influences which are being and have been exerted in the affairs of mankind by that noblest and most dignified profession.

A Brakeman's Work.

A substantial increase of wages to its trainmen given by one of the larger roads last month has not secured peace and quiet. A study of the work done by the brakemen resulted in an order reducing the number assigned to each freight train, not unnaturally followed by a protest from the brotherhood.

It is interesting to note that this country forms an exception to the general practice in respect to manning a train. In Europe the position of brakeman is unknown. With the introduction of the air brake, there would appear to be no reason for his continuance here, were it not that he is occasionally required to repack boxes, cut trains at railroad crossings, and to flag, which services may in time be transferred to the conductor. Most trains now carry two brakemen, and while one has his duties definitely fixed as flagman, of so little use is the other that on some roads he rides in the engine and on others in the caboose. When you have so little need for a man that you don't know where to put him, it would seem high time to dispense with his services. The following log of a train illustrates the situation pretty clearly:

Train 87 out of Cincinnati. At the appointed time for the engine and cabin car to leave Pendleton, the front brakeman made his appearance and threw the switches to let the engine on to the cabin car. The train crew got into the caboose and the engine pulled it to Crane street. After arriving at Crane street the brakeman had nothing further to do until the train was ready to proceed, as the coupling of the air hose and the trying of the air is performed by the inspector. This train had twelve cars of effective air brakes, and it was not necessary for the front brakeman to do any braking for the ordinary station or water tank stops; therefore he took his place on the front end of the firemen's box and remained there until the train reached Hamilton, 31 miles. On arriving at this point, if there is any work to do in the way of setting off or taking on cars, he assists. He also turns on the water at the stand pipe for the fireman. On leaving, he again takes his place on the fireman's box to Sommerville, 13 miles, where the train takes siding, the brakeman throwing the switch. After pulling out, the brakeman again takes his stand on the box until the train reaches Richmond, where he cuts off the engine from the train, throws one or two switches to get the cabin car on to the caboose track, completing his work.

Sometimes, in approaching meeting points and water tanks, the front brakeman gets out on top of the train four or five cars back in order to signal from one end of the train to the other. On some of the divisions where the trains are strictly through freight, and there is no setting off or taking on of cars, the work of the front brakeman is even less than here indicated, his only work being the transmitting of signals, throwing switches in going on sidings, and cutting the train at crossings if necessary.

It seems to be generally true that the use of the air brake has not reduced the number of brakemen employed on each train. The cars are larger and the number in the train has been increased, but the engineman does the braking, some mountain divisions excepted. It is the opinion of trainmasters and road foremen that in no case, in regular work, is more than ten per cent. of the brakeman's time usefully occupied, and it is usually even less than this.

If locomotives or cars or machine tools were handled so as to get only one hour a day of useful work out of them, the wastefulness would be indefensible, but in this relation the employee is precisely like the tool. The sum of his unoccupied hours is a heavy loss to the railroad, and he deteriorates more rapidly than does a machine. He rusts in idleness.

A recognition of the facts is all that is attempted here, and the remedy, which is not easy, is a splendid study for division superintendents who take their work seriously.

The Air-Brake Convention.

The Air-Brake Association completed the first decade of its existence with the convention held at Colorado Springs last week, and has cause to feel gratified over the results of these first 10 years of work. With one exception, the 1903 convention was larger than that of any previous year. Two of the subjects discussed were more than ordinarily interesting, namely, the high-speed brake, and the combined automatic and straight-air engine and tender brake, which was a topical discussion. The tenth convention has the unenviable distinction of being the first for which the committees failed to get their reports in to the Secretary in time for printing and distributing advance copies. They were presented to the convention in manuscript form, each being read by a member of the committee. Despite the unpreparedness of the members to discuss the reports many good points were brought out, and it may fairly be assumed that had there been advance copies for study the discussion would have been correspondingly more profitable. The experience of the Association this year in regard to its committee work is one which will doubtless be profited by in future, as it should impress on members of committees the need for beginning their work early to insure its completion in ample time for the convention. The tendency with too many such committees, not alone of the Air-Brake Association but in the other associations as well, is to do the work late and then try to rush it through. Such hasty work is unprofitable, even though the ground included in the subject be entirely covered. It has often been said in explanation and defense of neglected committee work that it must be done by busy men whose time is already fully taken up by regular duties; also that the different members are usually at widely separated points and committee meetings are difficult to arrange to suit the convenience of all of the members. This is all quite true and only emphasizes the fact that the greater the length of time the committee allows itself for accomplishing its task, the greater will be the number of spare moments found to devote to it; also for finding opportunities for a majority of the members to get together.

The Air-Brake Association is fortunate in having ample time in which to discuss its reports. The sessions are usually four hours long and only one report a day is considered. However, it is expected that one hour of the four shall be given to topical discussions. In the absence this year of one of the committee reports additional time was afforded for these discussions and gave opportunity for the presentation of the paper on the combined automatic and straight-air engine and tender brake. The interest which the paper and discussion developed makes it appear that the result was fully as profitable, perhaps more so, than consideration of the report on recommended practice would have been.

The New York State Court of Appeals has declared unconstitutional the law making it a misdemeanor for any person or corporation contracting with the State or with a municipal corporation, to require more than eight hours as a day's labor. The Orange County Road Construction Co. was indicted for requiring some of its employees to work 10 hours a day on highway improvement. The decision of the county judge was reversed by the Appellate Division of the Supreme Court, but is now sustained by the court of last resort, which holds that the requirement of the statute does not come within the police power which is vested in the Legislature. It is recognized that the Legislature has powers of restraint against what would otherwise be the rights of a private citizen in the interests of public health, public morals and public order, but the court considers that the fact that the employer is executing a contract for State or municipal work, can have no possible bearing on the health or security of the employees. If the company were executing a private contract in the next town, it would be free to set the length of the working day at whatever limit it pleased, while the same action, involving the same character of work, would, by the statute, become criminal, if done in performance of a contract made with the public. The State may prescribe regulations for the conduct of its employees where it carries on the work itself, but its rights are the same as those of private citizens; neither less nor greater, and the right conferred by the statute of imposing the limitation of the working day on contractors is unconstitutional and class legislation.

Railroad progress in Russia has certainly been rapid since 1890, though the mileage of the country is still insignificant in proportion to its area and population. The latest figures for operation are for 1899. At that time since 1890 (including all Russian territory) the length of railroad had increased 73 per cent., the passenger traffic 125 per cent., the freight traffic 122 per cent., the passenger earnings 73 per cent., and the freight earnings 86 per cent. The average rate per passenger-mile fell 23 per cent., from 0.817 to 0.630 cent—now the lowest in the world except in India. At the same time the average rate per ton per mile fell from 1.03 to 0.86 cent, and has become the lowest in Europe. In spite of these great reductions, the net earnings per mile have been maintained ($3,352 in 1899 and $3,289 in 1890). The gross earnings per mile increased 11½ per cent., the net, less than 2 per cent. The opening of the railroads in Asia has had an unfavorable influence on profits, as in 1899 their expenses exceeded their gross earnings, and their traffic was very light. They then formed 11 per cent. of the mileage of the Russian system, and yielded about 6 per cent. of its gross earnings, and no net earnings. With a rate of 0.39 cent per passenger-mile and less than 1 cent per ton-mile in a country which is still mostly a howling wilderness, direct profits are not to be expected, but the settlement and exploitation of the vast national domain will doubtless justify the expenditure economically in course of time; and other than economical reasons were weighty.

A large committee (42 members) of the lower house of the Austrian Parliament has long been considering proposals to incorporate several of the most important private railroad systems of the country into the State system, which consists in large part of lines which had fallen into the hands of the State because they were unprofitable. This committee has now reported in favor of the acquisition of four of the principal systems of the country. The administration is disposed to go slowly in this matter, because the national finances are not in condition to assume considerable risks; but the disposition of the administration as well as of the public and the press indicates that the people desire that the State eventually work all or nearly all the railroads of the country.

NEW PUBLICATIONS.

Proceedings of the American Railway Association, April, 1899, to October, 1902, inclusive. New York: 24 Park Place. Price $5.

This is a volume 8 in. x 11 in., of 1,071 pages, being a full reprint of the semi-annual issues of the proceedings for the six meetings that were held within the period named. It appears that the pages were numbered consecutively throughout this term as the different reports were issued, so that there was no way to conveniently condense the matter without omitting some of the pages. By following this plan some of the material is repeated unnecessarily, swelling the book to a large size. This is the third volume of Proceedings issued by the association. It includes the committee reports presented at the meeting of April, last year, which, it will be remembered, contained a great mass of information on signals, tests for vision and the per diem car service rule. The volume contains a copious and carefully prepared index filling 20 pages. In this index the reader will find quite full abstracts of much of the work done by the association. For example, the summary of the report of the car service committee on per diem, and the discussion thereon, fills a whole page.

Supplement to the Iron and Steel Works Directory.—Published by the American Iron and Steel Association, Philadelphia, 1903. 196 pages. Price $5.00.

The early editions of the Directory were confined to descriptions of plants producing iron and steel. Collateral to this, information has been given, in recent years, regarding the principal consumers, and the present supplement contains a descriptive list of such: bridge building works, car building works, pipe and tube works, shipbuilders (iron and steel), etc. The lists have been carefully edited, and the information contained has been obtained direct from the manufacturers.

Directory of Directors in the City of New York.—Published by the Audit Co. of New York, New York city, 1124 pages.

The fifth annual edition, which is dated April 1, 1903, appears in the same form as previously. The first part, consisting of an alphabetical arrangement of names of directors and trustees followed by the names of the companies with which each is connected, has 137 more pages than last year. The volume also contains a list of banks, insurance companies, railroads and miscellaneous concerns having offices in New York.

TRADE CATALOGUES.

"*All-Electrical Interlockings*" is the subject of a pamphlet issued by the Pneumatic Signal Co., of New York and Chicago, announcing the readiness of the company to make switch and signal apparatus, not only of the manual and all-air systems, as in the past, but also with apparatus worked wholly by electric motors. The company has finished a large new factory at Rochester, and now offers low-pressure pneumatic interlocking; electro-pneumatic and manual interlocking, and all-electric. In the power machines, the interlocking (mechanical) is vertical, but in the manual machines the company offers both vertical and horizontal. For automatic signals the company makes an electric-motor semaphore. Railroad crossing gates are also offered. The principal merits claimed for the new electric apparatus are: automatic stroke-completer like that in the company's well known pneumatic interlocking, and giving the same advantage; a single lever for each cross-over, whether with or without movable point frogs; an independent circuit for each function; a dust proof box for each motor; the indication given by a battery current, so arranged that the indication cannot be given until the locking pin has entered the lock rod; and a single style of motor for all kinds of switches. The all-electric dwarf signal is worked by a long-pull magnet.

H. R. Heinicke, designer and builder of high factory chimneys, has issued a catalogue describing the system of building chimneys of circular cross-section with brick of a special form, known as radial brick. The catalogue is illustrated with numerous photographs, showing, among other pieces of work, what is alleged to be the tallest chimney in the world, 460 ft. high, at Halsbrücke, Germany. The headquarters of the firm is at Chemnitz, Germany; the American office is at 160 Fifth avenue, New York city.

Street and Electric Railroads.

The Census Office has issued a preliminary report of its inquiry into street and electric railroads throughout the country, for the year ending June 30, 1902. Although the statistics reported at the census of 1900 are not in all respects comparable with those for 1902, the totals indicate that during this period of 12 years the length of line has increased from 5,783 miles to 16,648 miles, or 188 per cent., and the number of passengers carried has increased from 2,023,010,202 to 4,813,466,001, or 138 per cent. Miles of line worked by animal power have decreased 95 per cent.; by cable power, 51 per cent., and by steam power, 76 per cent., whereas electric working shows an increase of 1,637 per cent. since 1890. The following general statistics are included in the report:

Number of companies		987
Length of main track in operation		16,648
Length of single track, miles		22,589
Total number of cars—		
Passenger	60,290	
All other	6,909	
		67,199
Steam engines—		
Number		2,337
Total horse-power		1,298,133
Dynamos for generating power—		
Number		3,257
Horse-power		1,200,138
Number of fare passengers carried		4,813,466,001
Number of transfer passengers carried		1,062,403,392
Total car mileage		1,097,806,884
Accidents—		
Persons killed		1,216
Persons injured		47,428

Condensed Income Account, Operating Companies.

Earnings from operation	$241,584,697
Operating expenses	139,012,004
Net earnings	102,572,693
Income from other sources	2,907,156
Gross income less operating expenses	105,479,849
Deductions from income, taxes, interest, rentals, miscellaneous	74,524,616
Net income	30,955,233
Dividends	15,908,216
Surplus	15,047,017

Balance Sheet, All Companies.

Assets.

Cost of construction and equipment	$2,088,963,677
Other permanent investments	128,458,625
Cash on hand	27,342,313
Bills receivable	22,247,704
Supplies	10,340,448
Sundries	150,964,350
Total	$2,428,317,117

Liabilities.

Capital stock	$1,216,277,989
Funded debt	929,328,656
Bills and accounts payable	94,858,371
Interest due	13,748,010
Dividends due	2,342,827
Sundries	130,589,472
Profit and loss	41,171,792
Total	$2,428,317,117

Average Number of Employees and Salaries and Wages.

Salaried officials	2,749
Salaries	$4,625,015
Clerks	4,301
Salaries	$2,573,936
All other employees	131,133
Wages	$77,437,324

If the combined capital stock and funded debt, as given, be divided by the miles of main line in operation, it will be seen that our entire national system of traction is capitalized at about $128,880 per mile, as against approximately $61,332 per mile capitalization of all the steam roads in the country.

The Mileage of Switch Engines.

It has been the accepted practice since the convention of the Master Mechanics' Association at Boston in 1872 to credit a switching locomotive with six miles an hour for the time that it is in service. Other arbitrary mileages have been proposed from time to time, but all have been, more or less, based upon the averaging of a number of guesses.

It is with a view of securing some definite information upon this subject that Mr. George L. Fowler, with the co-operation of a number of railroad officials, has been conducting a series of investigations on engines in service. The gentlemen through whom arrangements were made and to whom acknowledgments are due for the courtesies extended are Messrs. W. F. Potter, General Superintendent Long Island Railroad; A. M. Waitt, late Superintendent Motive Power of the New York Central; F. D. Casanave, General Superintendent Motive Power of the Baltimore & Ohio; W. S. Morris, Superintendent Motive Power of the Erie, and G. W. West, Superintendent Motive Power of the New York, Ontario & Western.

A revolution counter was attached to the crosshead of the engine so that each revolution either forward or

backward would be recorded. The counter was kindly furnished by the Crosby Steam Gage & Valve Co. A short connection was pivoted on a stud screwed into the crosshead and led back to a swinging arm hung on a bracket bolted to the running board. From this arm another connection was carried forward to the swinging arm of the counter.

Readings were taken every day but engines that were in service 24 hours a day were frequently read every morning and evening. The time was kept in the office of the engine despatcher, so that with the time, the number of revolutions and diameter of the driving wheels the average mileage per hour was computed. Some objections were raised to this method of ascertaining the mileage on the ground that the slipping of the wheels was counted. All the Superintendents of Motive Power to whom this matter was referred, believed that the engines should receive credit for the slippage which taxes their endurance to the greatest extent. Another objection was that the mileage obtained in different yards and in different services would vary to such an extent that any generalization would be impossible. It was, of course, out of the question to answer this objection in advance because of the total lack of information on the subject. Observation has shown, however, that the average variation is not as great as that of the same engine in the same service from day to day in a freight yard, although the average daily mileage of an engine in passenger service is remarkably uniform on account of the regular service demanded.

The chief point which has been brought out is that the arbitrary allowance of six miles an hour is altogether too high. The length of time during which the instrument was kept on the engine was never less than two weeks and in one case it was 11½ weeks. It was put upon nine different engines, five of which were used in freight and four in passenger switching. It was found that in every case, in comparing engines upon the same road, the mileage of the passenger was greater than that of the freight engine. All engines were the six-wheel or 0-6-0 type with a tender, there being small differences in the general dimensions. The following tables give the dimensions of the engines and the mileage made by each during the test.

MILEAGE OF FREIGHT SWITCH ENGINES.

Road.	Cylinders, ins.	Weight, lbs.	Diameter drivers, ins.	Place of trial.	Total mileage.	Total hours in service.	Total hours in service less time at coaling station.	Av. mileage for total hours in service.	Av. mileage for tot'l hrs. in service less time at coaling station.
N. Y., O. & W.	...	...	52	Norwich, N. Y.	2938.5	1198.5	....	2.50	...
Long Island	19 x 26	123,000	51	Jamaica, N. Y.	831.94	336.5	322.5	2.47	2.58
N. Y. C. & H. R.	18 x 24	97,000	51	West Albany, N. Y.	667.16	312.0	298.0	2.14	2.24
B. & O.	19 x 24	100,600	47	St. George, N. Y.	638.66	249.5	223.5	2.52	2.86
Erie	19 x 26	145,000	49	Jersey City, N. J.	660.30	352.0	326.0	1.94	2.03
Average								2.31	2.43

MILEAGE OF PASSENGER SWITCH ENGINES.

Long Island	18 x 24	93,900	51	Long Island City, N. Y.	702.96	229.25	214.75	3.07	3.27
N. Y. C. & H. R.	17 x 24	82,270	48	Mott Haven, N. Y.	468.51	193.00	178.00	2.43	2.63
B. & O.	19 x 24	100,600	48	Baltimore, Md.	839.27	320.50	293.50	2.62	2.86
Erie	19 x 24	98,100	47	Jersey City, N. J.	549.02	184.50	172.50	2.98	3.18
Average								2.78	2.99

Mr. E. T. White, Superintendent Motive Power on the Baltimore & Ohio, made a number of similar trials on that road a few years ago. Mr. White's results are, however, somewhat higher than those obtained in this work and are as follows:

Location.	Miles made in 24 hours.	Miles made per hour.
Baltimore	88.	3.66
Baltimore	72.5	3.02
Philadelphia	76.33	3.20
Philadelphia	90.80	3.75
Brunswick	83.82	3.49
Brunswick	83.42	3.47

The class of service of these engines is not known except that the one in Philadelphia, making an average of 3.75 miles an hour, was at work where there was a long haul, a condition that is particularly favorable to a high average mileage. Each test lasted from three to five days. The average of these six engines is 3.43 miles per hour, or a trifle more than the highest average made by any one of the engines in the recent trials. This investigation on the Baltimore & Ohio was made in February, 1899, and it has been suggested that the discrepancy between the trials made at that time and those just completed is due to two causes: The present congested condition of the yards and the increase in the number of high capacity cars, whereby the engines are more heavily loaded, and, therefore, move more slowly.

Careful observation has led to the conclusion, that under the ordinary conditions of strictly yard work, it is impossible for an engine to maintain an average of even four miles an hour for several hours at a time. Under certain very favorable conditions during the past six months engines have made five miles an hour for 15 minutes, but never even four miles for a half hour at a time. For strictly yard work, four miles an hour for passenger switchers and 3½ miles for freight switchers would undoubtedly be a liberal allowance. One who has not paid particular attention to this matter will be surprised at the comparative slowness of all switching engine movements. The time consumed in standing still cuts down the average speeds. Whether it is possible to improve the record, cannot be either affirmed or denied from the data at present available, but certainly it does appear to be a matter that is worthy of further investigation.

The Haeseler Pneumatic Hammer.

The accompanying engravings show the principal features of a new type of pneumatic hammer which employs a rotary valve instead of the usual straight-line valve to reciprocate the piston. It is claimed for these hammers that they combine steadiness of action, slight friction and consequent wear of the moving parts and a great reduction of vibration so objectionable in tools of this character. Fig. 1 shows the valve in the box with the bottom cap removed, Fig 2 the valve and Fig. 3 the valve box. The valve rotates about the axis or trunnion which forms a part of the box, being actuated by the intermittent air pressure on the long projection or wing due to the alternate opening and closing of the ports above and below it in the box or case. At the same time a constant air pressure on both sides of the short wing forms an effective cushion to the valve's movement. Balancing is accomplished by making the parts in both the valve and box of relatively equal areas and locating them diametrically opposite to each other. Any pressure on one side of the valve is equalized by a corresponding pressure on the opposite side, and wear on the trunnion is reduced to a minimum. The arrangement of the ports is shown in Figs. 3 and 4, in which latter the dotted lines indicate the position of the exhaust passages. Since the valve moves at right angles to the line of motion of the piston its action is not disturbed when the hammer blow is struck and no fluttering or incomplete travel occurs as is so common with straight line valves. All the parts are made of steel, hardened and ground, and are guaranteed against breakage from service.

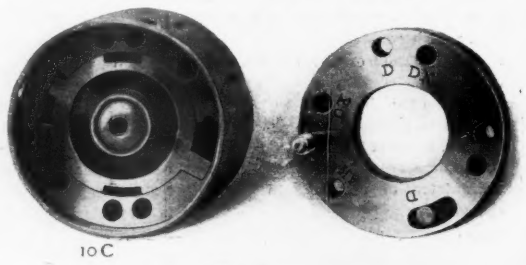


Fig. 1.

Fig. 2.

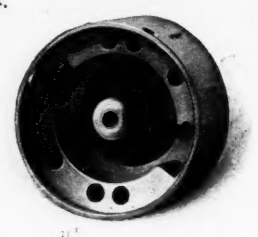


Fig. 3.

The arrangement for locking the valve head to the barrel is ingenious. A number of slots are cut in the collar of the cylinder and a slightly larger number of slots in the end of the handle. When the handle is screwed up tight the two parts are locked together by a key inserted in the registering slots in both parts and a spring band snapped over it and around the collar of the cylinder. This device gives a tight joint at the points marked A and B in Fig. 4 and permits a fine adjustment for wear in the parts.

The throttle valve shown open in Fig. 5 is positive in its action, and simple in construction; and it gives perfect control of the tool. Its operation is clearly shown in the engraving.

These hammers are made in sizes from 1 in. to 5 in. stroke for chipping and from 6 in. to 9 in. stroke for heavy riveting. They represent a distinct advance in pneumatic hammers. The Haeseler-Ingersoll Pneumatic Tool Co., New York, is the maker.

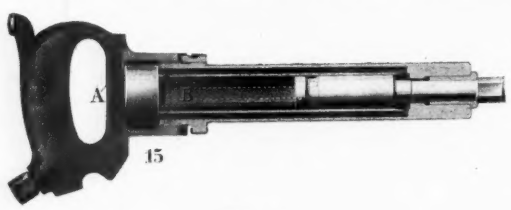


Fig. 4.

Fig. 5.

Induction Motors for Multiple Speed Work.

In direct-current work requiring continuous operation at any one of several speeds, it has become quite common to secure wide speed ranges by providing several impressed voltages. This method is not applicable to alternating-current work, because variations of the impressed e.m.f. do not affect the speed of a motor within practical limits, and only disastrously when they affect it at all. But the number of stator or field-magnet poles and the frequency of the alterations of the supply current control the speed absolutely. The expedient of using field-pole permutation in order to obtain several speeds is, of course, old, and has been applied in a number of instances. But the practical disadvantages are such that this method is available only to a very limited extent. By combining field-pole permutation with a plurality of impressed frequencies, however, one may obtain a range of speeds fairly comparable to the direct-current range, except as to gradations between the "fundamental" fixed speeds.

No great complexity is entailed by winding the primary of an induction motor so as to obtain two speeds of a ratio of 2 to 1 by means of changing the connections of the windings. This is directly analogous to the result primarily obtained by putting two windings and commutators on a direct-current motor. The speed and power are varied in the same ratio in both cases. Additional speed rates may be obtained with the alternating-current system, of course, by providing several frequencies. With frequency sources of 20, 25 and 30 cycles, there could be obtained also 40, 50 and 60 cycles without serious complication, and these frequencies combined with 2 to 1 field-pole permutation on the motor would give a speed range of 6 to 1, in very convenient steps, the greatest "jump" being 25 per cent., in passing from 20 to 25 cycles. Unfortunately, no gradation is practicable between the several successive speeds fixed by the frequency, such as that obtained by regulating the field excitation of a direct-current motor. Then again, the provision of a combination frequency changer to give different frequencies in different circuits would be expensive, since frequencies cannot be added, like direct-current e.m.fs., merely by combining two or more in series. The problem appears to be a very attractive one, however, and the development of some economical means of converting a single alternating-current frequency into several others and varying the latter individually through a small range would undoubtedly justify a very large expenditure of time and money. The accomplishment of this result in a practical manner would put the induction motor substantially on a level with the direct-current motor for machine tool and other multiple-speed driving. —*American Electrician.*

Foreign Railroad Notes.

The Vienna Locomotive Works reports for 1902 that business has continued to fall off.

The Upper Congo and Great African Lakes Railway Co. of Belgium has begun work on its line from Stanleyville to Ponthierville, Central Africa, and the government has begun to open up the rubber and ivory trade in the 10 million acre concessions of the company. An engineering party from Belgium has been sent to the Congo to investigate the mineral resources of this territory.

The Prussian Minister of Public Works in a reply to questions of members of the Parliament March 24, said the question of larger freight cars continued to occupy the attention of his department. He had recently detailed several experts in railroad and water transportation to visit America to study the appliances for loading cars

from vessels and vessels from cars, and other methods which have proved effective in practice.

Liquid air has become an article of commerce in Germany sufficient to lead the authorities of the German Empire to prescribe the kind of packing required for its transportation. It must be in glass bottles with double walls, resisting the transmission of heat, covered with felt; and with felt stoppers which will permit the gases to escape without producing any important interior pressure, and yet keep the liquid air from flowing out. Or, other packing which protects the contents from warming and vaporizing may be substituted.

The Chinese Eastern Railroad has now steamers plying from the Pacific terminus at Dalni to Nagasaki in Japan and Shanghai in China, and it is at last possible to make the journey from Western Europe to these places with something like regularity. To overcome the passport difficulties it is purposed that the holder of a through ticket have his photograph and signature on the ticket, which will then serve as a traveling pass naturally not good away from the line of the railroad.

The London & North-Western has built a number of trains of passenger cars for London suburban service which are 9 ft. wide, 6 in. wider than the usual English cars. In the new trains each car is 52 ft. long over the buffers and a train of eight accommodates 562 passengers; 144 first-class, 250 second and 168 third, in 18 first-class, 25 second-class and 14 third-class compartments. These new trains have the automatic vacuum brake and there is a cord by which passengers can give a stop-signal by partly applying the brake; also electric lighting, with accumulators, and continuous steam heating.

TECHNICAL.

Manufacturing and Business.

The Federal Supply Co. has moved its general offices in Chicago from the Auditorium to the Stock Exchange Building.

The Philadelphia Pneumatic Tool Co. reports sales for the first four months of 1903 39 per cent. greater than during the same period last year. New branch offices have been opened in Denver and in Salt Lake City.

The St. Louis Expanded Metal Fireproofing Co., Century Bldg., St. Louis, has established branch agencies at New York, Buffalo, Chicago, Kansas City and San Francisco. A. L. Johnson is the company engineer at headquarters.

The Geo. W. Brown Railway Supply Co., with $250,000 capital, has been incorporated by Geo. W. Brown, Chas. F. Easterday, Geo. D. Stemhauer and Dan C. Spencer of Vandalia, Ill., and Frank P. McDermott, of Jersey City, N. J.

The Ajax Metal Company, of Philadelphia, has an order to begin delivery as soon as possible, to the Baldwin Locomotive Works, of Ajax plastic bronze driving, truck and tank bearings for 300 locomotives to be built for the Pennsylvania.

The Plunger Elevator Company, of Worcester, Mass., has sold an elevator with a lifting capacity of 14,000 lbs. to the MacAndrews & Forbes Licorice Co., Camden, N. J. The elevator will carry loaded cars from one floor to another, the total travel being 24 ft., and no counterweights or cables will be used.

A million feet of Wyckoff conduits treated with dead oil of coal tar and laid in 1884, have just been examined by the New York & New Jersey Telephone Co., and found in perfect condition. This material was supplied by the Wyckoff Pipe & Creosoting Co., whose works are in Portsmouth, Va. This company also makes creosoted ties, telegraph poles, cross arms, piles and lumber.

Robert W. Hunt & Co. have moved their New York office to larger quarters at 66 Broadway. Messrs. John J. Cone and James C. Hallsted, of this firm, have just sailed for Europe. Mr. Hallsted has gone to inspect the structural material for two large London hotels. These and other important contracts have compelled the firm to organize a foreign structural and bridge department.

Iron and Steel.

The Whiting Foundry Equipment Co., Harvey, Ill., is said to have increased its capital from $270,000 to $400,000.

The Western Malleable & Grey Iron Mfg. Co., Milwaukee, Wis., has increased its capital from $25,000 to $100,000.

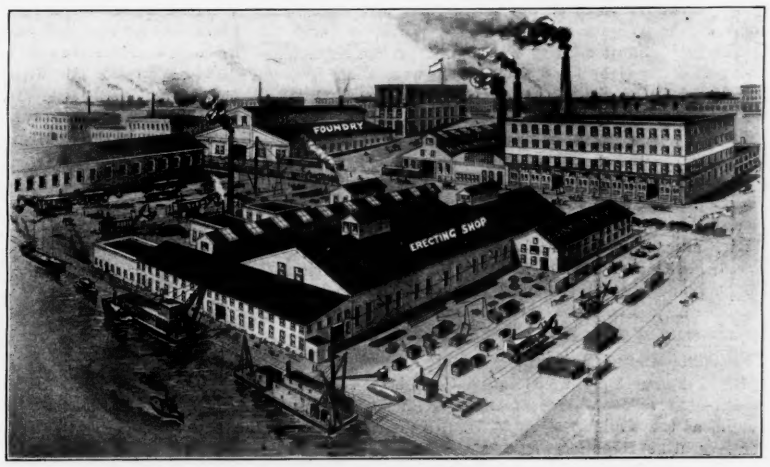
The Chicago Car Wheel & Foundry Co., Chicago, Ill., has been organized with $300,000 capital, by E. N. Mills, R. W. Hayden and T. W. Betak.

"Rail-less Street Roads."

The Austrian Parliament recommends to the government the establishment of "rail-less electric street roads," which, being interpreted, means a service of automobiles in connection with trains. Something of the kind has been done over a few routes on the Continent; but the whole credit of calling them "rail-less street roads" is due to the Austrian Parliament.

Addition to Vulcan Iron Works Plant.

The Vulcan Iron Works Co., Toledo, Ohio, maker of the Giant steam shovels, has recently completed a new building which will be used entirely for erecting steam shovels. Additional machinery has been put in, including an air compressor, a large punch and an additional power hammer. The accompanying illustration shows the general layout of the plant.



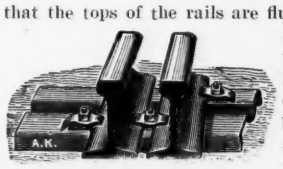
Plant of the Vulcan Iron Works.

Alcohol Motors.

The Prussian Minister of Public Works has reported the results of experiments in the use of alcohol for motive power and for illumination, made in the hope of increasing the market for alcohol, produced largely in Prussia, in place of petroleum, imported from America or Russia. The State railroads used 26 alcohol engines for pumping water at different places. With spirits costing 16⅔ cents per gallon, the cost of fuel for a given amount of work was lower than with benzine, duty paid, but somewhat higher than with petroleum, and materially higher than with the fluid hydro-carbon produced in making oil gas. The costs of attendance and maintenance were less with alcohol than with petroleum and the hydro-carbon, and about the same as with benzine. On the whole the service with alcohol is as cheap as with petroleum, and cheaper than with benzine, but dearer than with the artificial fluid hydro-carbon, which, however, is produced only in limited quantities. In selecting alcohol motors, care must be taken to obtain such as secure a complete utilization of the spirit, which requires a high compression of the mixture of alcohol vapor and air.

Shop Tracks in Cement Floors.

Instead of single rails, as in case of regular light railroads, two ordinary tee rails are placed close together on each end of the track, mounted on steel ties as shown in the cut. The track is sunk in the floor or ground so that the tops of the rails are flush with the ground level, and the space between the two sets of rails is leveled up with concrete, or wooden blocks, or bricks. The wheels run on the outer rails, the wheel flanges traveling in the slots between the outer and inner rails. For all industrial purposes, as well as for providing factories, with complete track layouts, these tracks, either double rail or single rail, are furnished in sections of the required length with the necessary curves bent as required, switches, turn-table, etc., to complete the system. The manufacturer is Arthur Koppel, 68 Broad street, New York.



New Electric Locomotives for B. & O. Tunnel.

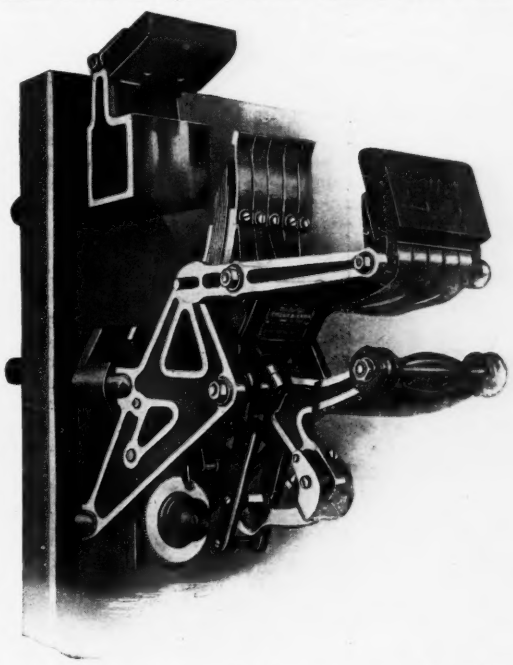
The Baltimore & Ohio will receive during the next two weeks the first of two 150-ton electric motors, for service in the Baltimore tunnel. These motors are the heaviest ever built and with the three 96-ton motors now in use, will enable the company to haul all freight and passenger trains from Camden Station to the top of the grade, without assistance from the steam locomotive. The locomotive is made up of two independent duplicate sections coupled together, each section being equipped with four GE-65 motors and type M control so arranged that either section can be operated independently, or from any one section two or more sections can be controlled. The capacity of the locomotive can at any time be increased by adding duplicate sections as desired. Two sections of the locomotive weighing together 150 tons are designed to handle a loaded train weighing complete with steam locomotive, but exclusive of electric locomotive, 1,500 tons, over the belt line grade from Camden Station through the tunnel to the summit, a distance of 3.44 miles, at approximately a maximum speed of 10 miles an hour on the .8 per cent. grade and at nine miles an hour on the 1½ per cent. grade; the voltage being 625.

The main body of the truck consists of a rectangular frame work of cast-steel built up of four pieces, two side frames and two end frames. The truck frames are supported at four points on equalizers. Each equalizer rests on a pair of half elliptic springs, the ends of which are supported on top of the journal boxes through suitable wearing plates. In order that the locomotive may round curves easily, the axles are given considerable lateral movement in the journal boxes. Each section of the locomotive has eight steel-tired spoked wheels. The axles are made of forged steel turned throughout and are 6 in. x 12 in. in the truck journal bearings, 8 in. in the wheel pit and 7½ in. in the motor bearings.

The sides and roof of the cab are sheet steel. On each side is an entrance door, and at each end is an additional door for communicating between sections when coupled together. The controlling apparatus consisting of master controller, engineer's valves, etc., is in duplicate, a complete set being located in diagonally opposite corners of each cab so that the engineer can stand in the front end of the locomotive when running in either direction.

S. K. C. Circuit Breaker.

The S. K. C. circuit breaker illustrated herewith has an independent opening action. Should an attempt be made to close the circuit breaker on an overload, the closing toggle will be automatically disconnected from the operating handle and the jaws will open, regardless of the pull which is being applied to the handle, the instant that sufficient current passes through the carbon contacts to operate the tripping device. To trip by hand, the closing action is simply reversed; i.e., the operating handle is pushed up. By an ingenious arrangement of the iron core and the magnet coil, two turns are made around the core in a limited space. The iron core consists of two parts, one fixed and the other movable, which are so arranged as to have but one air gap in the magnetic circuit. The movable portion of the core operates the tripping device. The main contact blocks are bridged by a sectional laminated copper arm, each section of which may be adjusted separately to secure the best contact. The main contact blocks are fastened to the marble base independently of the studs. The arc-rupturing carbons come together with a sliding action, as can be seen from the illustration, which renders their breaking impossible. The surfaces are unusually large and the rubbing action taking place between them when the breaker is opened or closed ensures clean contacts. As will be seen from the illustration, a long break between the carbons is secured with a comparatively short movement of the main contact arm and arcing occurs at a safe distance from all metal parts. It should be noted that in addition to the shunt circuit through the carbon contacts, there is also



an auxiliary shunt composed of smaller copper arms which remain in contact momentarily after the main contacts are opened. The setting device consists of a rack, having a projecting bracket upon which rests the movable section of the magnetic core, and a pinion, engaging therewith, at the end of a short shaft which carries on its outer end a helical spring, a notched dial and an insulated knob. By rotating the dial, the air gap in the tripping magnet may be varied. The operation of setting consists simply of pushing the knob, so that the dial is free from the index pin, holding it secure, and rotating it until the figure indicating the desired tripping point is opposite the index pin. On releasing the knob, the dial springs out and locks itself to the pin. These circuit breakers operate on either direct or alternating current circuits and are made in capacities from 200 to 3,000 amperes. They were designed by the engineers of the Stanley Electric Mfg. Company, of Pittsfield, Mass., and are being put on the market by that company.

THE SCRAP HEAP.

Notes.

Chicago reports indicate that all of the roads competing with the Wisconsin Central will follow the action of that company in absorbing switching and cartage charges in Chicago, Milwaukee, St. Paul and Minneapolis, where necessary to maintain what they call equal competition.

The United States Court of Appeals has affirmed a verdict of $20,000 against the Delaware, Lackawanna & Western in favor of Easton E. Devore, a child injured at a grade crossing in New Jersey about 11 years ago, the child being then only 18 months old. The lad is now an idiot.

The Atchison, Topeka & Santa Fe now sells local tickets in California limited to a very short time in order to prevent the misuse of the tickets; in order to do this the rate for each ticket has been made one cent below that prescribed by the State; this in order to avoid disobedience of the law requiring tickets at the regular rate to be valid for six months.

The Governor of Wisconsin has sent to the Legislature a special message discussing at length the question of State regulation and making comparisons between the average rates charged for the transportation of freight by the railroads of Wisconsin and those charged in Iowa; and he demands the establishment of a railroad commission to prescribe rates.

The United States Circuit Court at Pensacola, Fla., has granted a temporary injunction restraining the State Railroad Commission from reducing passenger fares on the Louisville & Nashville to a uniform basis of 3 cents a mile. The Commission had issued an order to this effect to be put in force May 1. Argument will be heard May 26 on a motion to make the injunction permanent.

The interchangeable 1,000-mile ticket to be sold at $30 with a refund of $10, to be issued by the trunk lines, will be put on sale June 1. The roads named in the announcement are the Baltimore & Ohio, the Chesapeake & Ohio, the Delaware, Lackawanna & Western, the Erie, the Lehigh Valley and the Pennsylvania. The Baltimore & Ohio announces that these tickets will be received by the Reading and the Central of New Jersey between Philadelphia and New York.

A law has been passed in Massachusetts authorizing street railroads to carry freight and baggage, but on condition that the city or town officials shall consent that the State Railroad Commissioners shall certify public necessity and convenience, and that the State and local authorities shall make such regulations as they may see fit. The companies are to be subject to all laws relating to common carriers. The authorities must hold public hearings before granting consents.

The Trunk Lines and their western connections have reduced the domestic rate on flour and grain from the West to the Atlantic Seaboard to the basis of 18 cents per 100 lbs., Chicago to New York; a reduction of 2 cents. The export rate is reduced from 16 cents to 15½ cents on flour and 14 cents on grain. The reductions like similar reductions at this time in previous years, are made mainly on account of the opening of lake navigation, but it is said that the new rate is made 18 cents instead of 17½ for the purpose of showing that the railroads do not wish to comply with the recommendation of the Interstate Commerce Commission in the decision recently issued by that body.

The Chicago & North Western has notified its connections in Chicago that on cars delivered to it to be switched in that city it will not pay per diem charges. This is, we suppose, an effort to simplify the handling of this class of business by doing away with the "reclaim" account. At the time the per diem interchange rule was adopted, a year ago, the North Western was one of the chief objectors, and, as is well known, this Chicago switching problem was the principal ground on which the company's objections were based. The North Western switches from 8,000 to 10,000 cars a month in Chicago for its connections, while the number switched by the connections for the North Western is very small.

On the evening of May 3, about 9 o'clock, at Canfield and De Quindre streets, Detroit, a passenger train dashed into a crowd of several hundred excursionists standing on the track, killing seven of them. Thirty others were badly injured. The crowd consisted chiefly of a Polish church society from Toledo. They were waiting for a train of the Lake Shore & Michigan Southern and were run down by one of the Grand Trunk on a track parallel to that of the Lake Shore. The police say that they had done their best to keep the crowd off the tracks. The engineman of the Grand Trunk train is reported as saying that he was running at only about 12 miles an hour. The light from the Lake Shore engine had made it impossible for him to see the crowd until he was close upon it.

New Buildings at Army Posts.

The Secretary of War has approved the recommendations of the War College Board for the construction of new buildings and other improvements at all the Army posts, for which $6,000,000 was appropriated by Congress last session, $1,000,000 to be used at Manila, P. I., and $5,000,000 in the United States. The principal improvements will be made at 51 different posts. At Fort Myer, Va.; Fort Riley, Kan.; Vancouver Barracks, Wash., and Fort Barrancas, Fla., shops for field artillery will be built.

The Telegraph Cheaper Than the Mail.

It is remarkable how much telegraph business is transmitted by private concerns over their leased wires. Houses which employ none but first-class operators and conduct their business in an intelligent and economical manner, state that they are enabled to handle messages at an actual cost of not over 2 cents each. The rate is so low that it does not pay to make use of the mails. Addresses and signatures are cut down to one or two letters each. In handling private wires understandingly the telegraph is cheaper than the mail.—*Telegraph Age.*

Free Rides on the New Haven.

Within a reasonable time after train No. 1,420 left New Haven for Ansonia last week, the conductor reached out to receive a ticket from a lady passenger. At the moment of receiving the ticket, a bull terrier sprang from the folds of the lady's cloak and seized the hand of the conductor, who did not hesitate or stop to think—he began at once to work hard. When at last he disengaged his right hand, the terrier was in an ignoble position, held by the nape in the conductor's left. The car window was open, and remembering rule 931a—that dogs are not allowed in coaches—the conductor tossed him, and the ticket, out of the window. The hand had been severely bitten and the wounds were cauterized at Ansonia. The final item of the incident seems unbelievable, but that, in itself, does not impair its truth. The terrier arrived two hours behind train time at his mistress's house in Ansonia, with the ticket in his mouth. The lady does not recommend this method of getting a free ride on the cars, because all terriers cannot be relied on to keep and bring home the unused ticket.

The Trans-Andine Railroad.

R. E. Mansfield, United States Consul at Valparaiso, in a recent report to the State Department, gives some details of the Trans-Andine R. R. to connect Chili with the Argentine Republic, on which work now appears to be going on. This road was projected over 20 years ago, but the bill failed to pass the Chilean Congress until the last session. The line extends from Buenos Ayres to the Cumbre of the Cordillera at Uspallata Pass, and is being built by the Argentine Government. Work on the new road is being pushed forward on both sides of the mountains, and the line in Chili is completed as far as Salto del Saldado. During the summer months traffic is carried on over the mountains, along the route of the proposed railroad, by mule caravans, and it requires but one day to make the trip between the terminals. The pass is crossed at an elevation of 13,000 ft. above sea level, but the route, as surveyed, provides for a tunnel through the mountains. The President of the Chilian Republic is empowered to contract for the Chilian end of the road. The State is to guarantee 5 per cent. interest for 20 years, on a sum not to exceed $7,299,750 for building the road. The State has the privilege of purchasing the road within five years after its completion for a sum which may not exceed the capital invested and 10 per cent. interest.

Are Cabs On Boilers Dangerous?

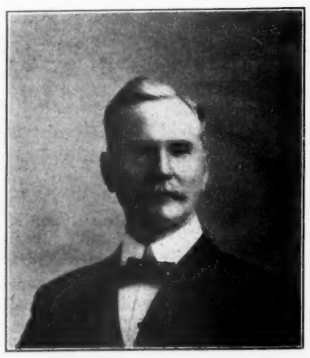
Within the past four months there have been among our great family of brothers approximately 195 deaths from all causes. One hundred and ten natural deaths among the 33,000 insured in four months is very low, but 78 killed and 13 amputations of arm or leg is not a cheering record. What is the cause? From the number reported as killed in wrecks one must conclude that the present mode of constructing locomotives, the exposed condition of the engineer on top of the boiler, and lessened opportunities to get off in case of danger, must account in some measure for the long list of casualties. That the mode of construction commonly called no-deck creates extra hazard has been contended by the majority of men who run them for several years. Many engineers sitting on top and near the middle of the boiler, feel that if the engine leaves the track it is almost sure death.

It required heavy damages in the courts before the necessity of going to the front end of the engine to oil the valves was stopped, and a long siege was required to secure automatic couplers and air-brakes on cars. Both appeals were made in the interest of humanity, and to save life, and both have proved not only in the interest of the employees, but the companies as well.

If engineers really feel that there is an extra hazard in running engines with cabs on top of the boilers of locomotives, they should make that opinion manifest, so that the officials may know what is the consensus of opinion, and why.—*Locomotive Engineers' Magazine.*

PERSONAL.

—Mr. George Dickson, Master Mechanic of the Missouri Pacific shops at Baring Cross, was born at Montreal, Canada, in 1857. Mr. Dickson enters the service of this company after 22 years service on the Great Northern. In 1881 he went west as a machinist for the latter company. He afterwards became Master Mechanic, which position he held for four years, when he was promoted to be foreman of the machine and erecting shop, under Mr. W. T. Reed, then Superintendent of Motive Power. Mr. Dickson then became General Foreman, and in March, of this year, resigned to go to the Missouri Pacific as above.



—Mr. Virgil G. Bogue, Consulting Engineer and expert on railroad constructions, has returned from Mexico. His New York office is changed from No. 66 Broadway to No. 15 William street.

—Mr. Hugh L. Bond, who has become Second Vice-President of the Baltimore & Ohio, was previously General Attorney of this company. Mr. Bond is 45 years old and is a native of Baltimore. He was graduated from Harvard in 1880 and two years later began his railroad service as an assistant in the office of the General Counsel of the Baltimore & Ohio, and has since been connected with the law department of that company. For two years, 1892-1894, Mr. Bond also acted as General Counsel for the Receivers of the Richmond & Danville, now a part of the Southern.

—Mr. Agnew T. Dice, the new General Superintendent of the Philadelphia & Reading, was born at Scotland, Pa., in 1862. At the age of 19 he went to work for the Pennsylvania and was with this company as rodman, Assistant Engineer, Assistant Supervisor of Signals and later Supervisor of Signals until 1892, when he resigned to go to the New York Central & Hudson River, and for one year (1892-1893) was Superintendent of Signals on that road. In January, of the latter year, he was made Assistant Superintendent of the Hudson Division. In 1894 he resigned to go to the Atlantic City as Superintendent, and in February, 1897, was made Superintendent of the Shamokin Division of the Philadelphia & Reading, from which position he is now promoted to become General Superintendent to succeed Mr. Garrett.

—Mr. Irving M. Scott, the well-known shipbuilder, and for many years head of the Union Iron Works, San Francisco, died at his home in that city on April 28. Mr. Scott was born at Hebron Mills, Md., in 1837. He began his business career as a draftsman and entered the employ of the San Francisco Union Iron Works in 1858, becoming head of the concern in 1863. His name became celebrated in connection with the battleship "Oregon," which made the famous voyage around Cape Horn in 1898, and which was built at the Union Iron Works. Many other naval vessels were built there.

—The new Superintendent of the Rocky Mountain Division of the Northern Pacific at Missoula, Mont., Mr. B. E. Palmer, began his railroad service in the engineering department of the Union Pacific in 1887 as a chainman. He remained with the U. P. until 1892, when he was engaged in surveys and construction of new roads in Washington. In 1896 he was appointed Resident Engineer of the Northern Pacific, in 1898 was Roadmaster, and the next year was locating engineer. In 1900 he was promoted to the position of Supervisor of Bridges and Buildings and later became Division Engineer.

ELECTIONS AND APPOINTMENTS.

Algoma Central & Hudson Bay.—The officers of this company are: President, C. Shields; Vice-President, E. H. Sanborn, and Secretary and Treasurer, J. P. Hood; headquarters at Sault Ste. Marie, Ont.

Baltimore & Ohio.—H. O. Dunkle, Division Superintendent at New Castle, Pa., has resigned. (See Erie.)

Brooklyn Rapid Transit.—J. F. Calderwood has been elected Vice-President and appointed General Manager, with headquarters at Brooklyn, N. Y.

Buffalo & Susquehanna.—C. Peter Clark, heretofore General Superintendent of the Eastern District of the New York, New Haven & Hartford, has been appointed Second Vice-President of the B. & S., with office at Buffalo, N. Y.

Canadian Pacific.—C. W. Spencer, heretofore General Superintendent of the Eastern Division, has been appointed General Superintendent of Transportation of all Lines East of Port Arthur, with office at Montreal, Que.

J. Oborne, heretofore General Superintendent of the Atlantic Division, has been appointed to succeed Mr. Spencer as General Superintendent of the Eastern Division.

Carrabelle, Tallahassee & Georgia.—J. W. Clark has been elected President, with headquarters at Tallahassee, Fla.

Charleston, Clendennin & Sutton.—Charles Emmert has been appointed Purchasing Agent, with office at Charleston, W. Va.

Chicago, Burlington & Quincy.—New arrangements for the conduct of the freight business of the Burlington have been announced as follows: W. B. Hamblin, Assistant General Freight Agent, general supervision over tariffs for all Burlington system lines and in charge of prorating and percentage arrangements with railroads and water lines, and classification matters, with headquarters at Chicago. E. R. Puffer, Assistant General Freight Agent, with supervision over all freight traffic within Illinois, Iowa and Missouri; George P. Lyman, Assistant General Freight Agent, with supervision over freight traffic on the Northern Division, with office at Minneapolis; George Morton, Assistant General Freight Agent, supervision over eastern agencies so far as concerns westbound traffic originating in territory east of the eastern terminals of the road, and C. E.

Spence, Assistant General Freight Agent, in addition to supervision over all lumber traffic, will assist Freight Traffic Manager Thomas Miller.

Chicago, Milwaukee & St. Paul.—The statement made last week (p. 319) that J. N. Barr had been appointed Vice-President was erroneous. Mr. Barr has been appointed Assistant to the President. J. H. Foster, heretofore Superintendent of the River Division, has been transferred to the Chicago & Council Bluffs Division, with headquarters at Marion, Iowa, succeeding Mr. Earling and W. S. Cooper, heretofore Trainmaster, has been appointed Superintendent of the River, Chippewa Valley and Wabasha Divisions, with office at Minneapolis.

Cincinnati, Georgetown & Portsmouth.—G. A. Sawyer has been appointed General Freight Agent, with headquarters at Cincinnati, Ohio.

Davenport, Rock Island & Northwestern.—H. R. Williams has been elected President.

Des Moines, Iowa Falls & Northern.—P. A. Mitchell has been appointed General Manager and T. D. MacDonald, Master Mechanic.

Detroit Southern.—J. C. Homer has been appointed Superintendent of Motive Power, with headquarters at Springfield, Ohio, succeeding H. E. Passmore.

Erie.—H. O. Dunkle, heretofore Superintendent on the B. & O., has been appointed Superintendent of the Erie at Meadville, Pa.

Fort Worth & Denver City.—J. D. Welsh has been appointed Superintendent, with headquarters at Fort Worth, Texas.

Grand Trunk.—C. A. Hayes has been appointed Assistant General Freight Agent, with office at Chicago, Ill., succeeding David Brown, resigned.

Great Northern.—J. M. Davis has been appointed Superintendent of the Eastern Division, with headquarters at West Superior, Wis., succeeding D. M. Philbin, promoted.

Illinois Central.—R. C. Stillwell has been appointed Superintendent of the Tennessee Division, with headquarters at Fulton, Ky., succeeding J. G. Lorton.

Illinois Southern.—See Peoria & Pekin Terminal.

Iowa Central.—O. Davidson has been appointed Division Engineer, with headquarters at Marshalltown, Iowa, succeeding R. H. Wight, deceased.

Lehigh Valley.—E. H. Shipman has been appointed Assistant Engineer, with headquarters at Sayre, Pa.

New Hampshire State Railroad Commission.—Arthur G. Whittemore, of Dover, has been appointed Railroad Commissioner, to succeed the late Francis C. Faulkner.

New York, New Haven & Hartford.—C. Peter Clark, General Superintendent of the Eastern District, with headquarters at Boston, Mass., has resigned. (See Buffalo & Susquehanna). C. C. Elwell, Assistant Superintendent of the Shore Line Division, has been appointed Superintendent of the Air Line, Northampton Division, with office at New Haven, Conn., succeeding W. A. Waterbury, resigned.

Northern Pacific.—J. B. Baird, heretofore Assistant General Freight Agent, has been appointed General Freight Agent.

Macon, Dublin & Savannah.—F. R. Cooper has been appointed Master Mechanic, with office at Macon, Ga.

Missouri Pacific.—H. G. Clark has been appointed Superintendent at Atchison, Kan., succeeding C. M. Rathburn, resigned.

Pacific & Idaho Northern.—P. P. Shelby, heretofore Assistant to the President and General Manager, has been appointed Vice-President and General Manager.

Peoria & Pekin Terminal.—E. A. Burrill, heretofore Superintendent of the Illinois Southern, has been appointed Assistant Superintendent of the P. & P. T., with headquarters at Peoria, Ill.

Philadelphia & Reading.—H. C. Smith has been appointed Division Engineer, with headquarters at Philadelphia, Pa., succeeding J. S. Caldwell, resigned. F. McQ. Falck, Supervisor, has been appointed Engineer of Maintenance of Way, with office at Tamaqua, Pa., succeeding R. J. Stackhouse.

Richmond, Fredericksburg & Potomac.—C. W. Haines has been appointed Chief Engineer, with headquarters at Richmond, Va.

St. Louis, Iron Mountain & Southern.—J. S. McGuigan has been appointed Superintendent of the Illinois Division, with headquarters at East St. Louis, Ill. J. M. Walsh has been appointed Assistant Superintendent of the Central Division, with office at Van Buren, Ark.

Santa Fe, Prescott & Phoenix.—P. P. Hastings has been appointed Auditor, with headquarters at Prescott, Ariz., succeeding J. J. Wragovich, resigned.

Seaboard Air Line.—E. L. Kasemeier has been appointed Auditor of Disbursements, with headquarters at Portsmouth, Va., succeeding L. W. Guernsey, resigned.

Wisconsin Central.—C. W. Booth has been appointed Assistant General Superintendent. J. A. Whaling has been appointed to succeed Mr. Booth as Purchasing Agent, with headquarters at Milwaukee, Wis.

LOCOMOTIVE BUILDING.

The Vandalia is about to place an order for 17 locomotives.

The Atlantic Coast Line has reserved space at the Baldwin Works for a number of locomotives.

The Cincinnati, Richmond & Muncie has recently placed an order with the Baldwin Works for 20 locomotives.

The United Railroads of Yucatan have ordered nine narrow gage locomotives to be built at the Baldwin Works.

The Atchison, Topeka & Santa Fé is reported to have let a contract for a large number of locomotives to the Baldwin Works.

The Colorado & Utah Construction Co. is having two locomotives built at the Schenectady Works of the American Locomotive Co.

The Erie has reserved space with the Baldwin Locomotive Works and with the American Locomotive Co. for a large number of locomotives. Specifications have not yet been determined.

The Chicago, Milwaukee & St. Paul is building six switching locomotives at its West Milwaukee shops, and is about to build 10 2-8-0 locomotives. The switching locomotives are similar to those previously built in the company's shops.

CAR BUILDING.

The Pullman Company is building 15 coaches for general service.

The Denver & Rio Grande is in the market for 20 passenger coaches.

The Chicago, Rock Island & Pacific has ordered 40 coaches from the Pullman Company.

The New York Central & Hudson River is reported in the market for a large number of box cars.

The Chicago, Peoria & Western is having 25 freights built by the Bettendorf Axle Co., Davenport, Iowa.

The Chicago Great Western is having 150 freights built at the Chicago Works of the American Car & Foundry Co.

The St. Joseph & Grand Island has ordered two chair cars, two coaches and two combination baggage and mail cars from the Pullman Company.

The Erie has ordered nine coaches, two chair cars, four combination cars, five baggage, 10 suburban combination cars and 20 suburban coaches from Barney & Smith.

The Pittsburgh Coal Co. is building 100 wooden coal cars of 80,000 lbs. capacity at its Montour shops, for August delivery. The cars will weigh 34,000 lbs., and measure 35 ft. long, 10 ft. wide and 4 ft. 2½ in. high, inside measurement.

The Canadian Pacific, as reported in our issue of April 10, is building 200, 60,000 lbs. refrigerator cars of the Bohn system at its Perth shops. The cars will be 38 ft. 8 in. long and 8 ft. 11 in. wide, over frame. The special equipment includes: Nova Scotia Steel Co.'s axles, Simplex bolsters and brake-beams, Westinghouse air-brakes, Tower M. C. B. standard couplers, La Flare insulation doors, Miner tandem draft rigging, Harrison dust guards, McCord journal boxes, Canadian Pacific standard springs made by the Canadian Switch & Spring Co., Barber trucks and Canadian Pacific standard wheels.

BRIDGE BUILDING.

BATH, ME.—The War Department has pronounced the Bull Rock bridge across New Meadows River an obstruction to navigation and a new bridge will have to be built in its place.

BIRMINGHAM, ALA.—A. J. Tarrant, President Board of Revenue of Jefferson County, will receive bids until May 23 for three steel bridges and abutments.

BLUFFTON, IND.—It is reported that the Lake Erie & Western will build a $10,000 bridge over the Wabash north of this place.

BOSTON, MASS.—There is a bill before the Legislature for building a bridge over Charles River between Newton Upper Falls and Wellesley.

CARLTON PLACE, ONT.—E. T. Wilkie, Engineer for Dalhousie Township, will receive bids until May 25 for a steel bridge at the head of Dalhousie Lake. Bids for two concrete abutments will be received at the same time.

CASTLEWOOD, S. DAK.—L. H. Ford, County Auditor, will receive bids for a steel bridge until July 10.

CLEVELAND, OHIO.—The City Engineer has reported in favor of a new high level bridge, to cost $1,500,000, instead of a $500,000 roller liftbridge, for the Superior street viaduct.

ECHO, ORE.—The residents of Echo and Pendleton have petitioned the County Court for a bridge over Umatilla River.

EVERETT, WASH.—Plans are being made to issue bonds for a new bridge over Snohomish River near the Sumner Iron Works, to cost about $25,000.

GEORGETOWN, TEXAS.—Williamson County Commissioners' Court will build four new bridges.

GRAFTON, W. VA.—The County Court will receive bids until July 6 for a bridge across Three Fork Creek. S. Kitzmiller, Clerk.

HAGERSTOWN, MD.—Separate bids for substructure and superstructure for a bridge over Beaver Creek will be received until May 15 by the Board of County Commissioners.

HARRISBURG, PA.—The East End Improvement Association has petitioned the Council for a viaduct over the Pennsylvania R. R. at Walnut street.

HAZLETON, IND.—It is reported that bonds will be issued for a bridge over White River.

JACKSONVILLE, FLA.—Bids for a concrete steel arch bridge, 845 ft. long, 58 ft. wide, having 11 arches, to be built over the railroad tracks at Bridge street, will be received until noon, May 20, by E. B. Pleasants, Chief Engineer, care of M. Riddle, Superintendent Atlantic Coast Line Ry. Co., Byrd Street Station, Richmond, Va.

JOLIET, ILL.—New bridges will be built at Lorenzo, New Lenox, Wilton, Monee and Green Garden, in this county.

Bids will be received until May 12 for a $25,000 bridge to be built over Kankakee River by Grundy and Will Counties.

LANGDON, N. DAK.—The County Commissioners will receive bids until May 19 for a 60-ft. steel bridge over Milton River.

LEXINGTON, KY.—The Lexington & Eastern is said to have prepared plans for a steel bridge at Megowan street.

LIVINGSTONE, MONT.—The County Commissioners will receive bids until June 3 for the Shields River bridge.

LOS GATOS, CAL.—The bridge over Los Gatos Creek at Main street may be replaced by a steel structure.

MARION, IND.—It is reported that the Cincinnati, Richmond & Muncie R. R. will build several overhead bridges for street crossings.

MEMPHIS, TENN.—The city has appropriated $150,000 for the bridge and street department.

MILWAUKEE, WIS.—The City Engineer is preparing plans for the Washington street viaduct.

MOUNT VERNON, OHIO.—The County Commissioners will receive bids until May 16 for a 100 ft. bridge in Morris Township.

NELSON, NEB.—James A. Hitchcock, County Clerk, will receive bids until noon, May 21, for all bridges to be built in Nuckolls County during the coming year.

OREGON, MO.—C. G. Landon, Road Commissioner, will receive bids until May 8 for eight new bridges.

PARKERSBURG, W. VA.—The Parkersburg Bridge & Terminal R. R. Co., it is said, will build a bridge over Ohio River near the mouth of Little Hocking River.

PARKER, S. DAK.—The County Commissioners will receive bids until May 12 for a 70-ft. steel bridge over Vermillion River.

PEKIN, ILL.—Plans have been prepared for a $25,000 wagon bridge.

POTTSVILLE, PA.—Plans have been made for a new bridge on East Market street, from Logan street to Line alley.

ST. PAUL, MINN.—There is a movement on foot for another bridge over the Mississippi River to connect the lower parts of the city.

SULLIVAN, MO.—A new bridge is proposed over the Meramec River.

SURREY, B. C.—Bids will be received May 10 for a bridge with a draw, to be built over Serpentine River on Mud Bay road.

SAN JOSE, CAL.—The Board of Supervisors will receive bids until May 18 for a 170-ft. steel bridge over Coyote River.

WOONSOCKET, S. DAK.—The County Commissioners will receive bids until May 19 for a steel bridge over Redstone Creek.

WORCESTER, MASS.—The question is being revived of a bridge over Lake Quinsigamond at the causeway.

Other Structures.

BLOOMINGTON, ILL.—Plans are said to have been made for a large union passenger station.

DELRAY, MICH.—The Chicago Railway Equipment Co. is preparing to build a shop for making trucks and truck bolsters.

ESCANABA, MICH.—According to report, the United States Steel Corporation will build a $150,000 crusher here, with a capacity of 510,000 tons of ore a season.

HASELTON, OHIO.—The Pittsburgh & Lake Erie will spend $150,000 on improvements, including quarters for trainmen and a machine shop 65 ft. x 115 ft.

KELLY LAKE, MINN.—It is reported that the Great Northern will build a roundhouse, shops and coaling station.

LOUISVILLE, KY.—Plans are said to have been prepared by the Northwestern Steam Boiler Works for a new building to take the place of one recently destroyed by fire.

MEDFORD, MASS.—The Boston Steel & Iron Co. is said to be planning a new bridge and structural shop.

MOUNDSVILLE, W. VA.—The Board of Trade is planning to have a large pressed steel car plant built at this place. A company will be organized, and the city will give 45 acres of land as a site for the buildings.

PITTSBURG, PA.—Bair & Gazzan, according to report, have increased their capital stock from $100,000 to $350,000 for the purpose of building a new machine shop.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

APALACHICOLA NORTHERN.—The proposed route of this company is from River Junction, Fla., south to Apalachicola, about 70 miles. H. O. Clement, Valdosta, Ga., is Vice-President, and J. H. Trump, Secretary. It is reported that surveys are now in progress.

BALTIMORE & OHIO.—Bids are now being asked by this company for improvement work on the main line between Flushing and Bellaire, Ohio, 32 miles. The contract involves an expenditure of about $1,500,000, and calls for the completion of the work in one year. The first nine miles out of Flushing will be entirely new road, and from that point on, the old line will be rebuilt. The work includes the Flushing tunnel and a bridge span. The district engineer is W. B. Hanlon, Cleveland, Ohio.

BISMARCK, WASHINGTON & GREAT FALLS.—A contract has been let to Richards-Sundeen Co., of Minneapolis, for building an extension of this line from Washburn, N. Dak., in a northerly direction towards Turtle Lake, Lean County, a distance of 15 miles. Dempsey & Daugherty, of Grand Rapids, Minn., have a sub-contract.

BROCK R. R.—A charter was granted this company on April 27, to build a steam railroad two miles long, from a point south of the Erie passenger station at Brockwayville, Jefferson County, Pa., to Lane's Mill, Jefferson County, at Furman's Crossing. M. S. Kline, Ridgway, Pa.; L. P. Snyder and P. W. Cashman, of St. Mary's, Pa., are directors.

BUTTE COUNTY.—The proposed route of this new line is from Chico, Cal., to Paradise and thence north through Magalia, Coutolence and Lovelock to Stirling, Cal., 32 miles. Stone Bros., of Oakland, Cal., are the contractors. J. B. Robinson, Chico, Cal., is Chief Engineer. (March 20, p. 220.)

CANTON, ABERDEEN & NASHVILLE (ILLINOIS CENTRAL).—An amendment to its charter has been filed by this company providing for an extension from Brilliant, Ala., northeast to Double Springs, thence northwest to Sheffield, and along the Tennessee River to the Mississippi State line, 90 miles.

CHESAPEAKE & OHIO.—An officer writes that it has been decided to enlarge the Allegheny tunnel west of Covington so as to permit of a second track through it. Shanahan & Co. are the contractors. The tunnel is 4,703 ft. long, and it will take from six to eight months to complete the work. (April 10, p. 274.)

CHICAGO, BURLINGTON & QUINCY.—An officer writes that this company has located a line from Greenfield, Iowa, east to Winterset, and southwest to Villisca. Work will probably be begun in the fall, but no definite plans in regard to building this extension have as yet been made public. (April 24, p. 304.)

It is reported that work on the proposed extension of

this company from Ashland, Neb., northeast to Sioux City, Iowa, will be started early in June. Rights of way are practically secured and the line is now being located. (March 20, p. 220.)

CHICAGO, ROCK ISLAND & PACIFIC.—It is stated that this company is planning to re-ballast its main line through Iowa during the present season. Surveys are now being made for a cut-off from Avoca west to Minden.

DENVER, NORTHWESTERN & PACIFIC.—This company has recently secured rights of way from Kremmling into Eagle County. It is reported that a cut-off will be built from Denver to Wolcott, to connect with the Denver & Rio Grande.

DENVER, YANKEE HILL & WESTERN.—Incorporation has been granted this company in Colorado, to build from Central City west via Russel Gulch to Alice, 10 miles. E. E. Seymonr, Central City; G. R. Stewart, Alice, and others are incorporators.

DES MOINES & SOUTHERN.—Contract for building an extension of this line from Des Moines, via Winterset to Greenfield, Iowa, has been let to the Katz Construction Co. of Omaha. Rights of way have been secured and surveys made. Location surveys are also reported from Greenfield southwest through Adair, Adams, Montgomery and Page Counties to Manchester, Kan. (March 20, p. 220.)

DONALDSONVILLE & NAPOLEONVILLE.—Grading is reported on this line, which is building from Donaldsonville, La., south via Klotzville, Paincourtville and Avon to Napoleonville, 15 miles. The new line will parallel the Texas & Pacific for about half the distance, and will then run in a southerly direction along the west bank of the Bayou La Fourche to Napoleonville. W. M. McGalliard is President; M. D. Bringier, Vice-President, and H. E. Hanson, Secretary. The headquarters of the company are at Donaldsonville, La. (See Construction Supplement.)

ELLICOTTVILLE, MANSFIELD & EAST OTTO.—This company has been incorporated in New York to build from Ellicottville northwest via Mansfield to East Otto, 15 miles. Capital $300,000. C. C. Locke, Randolph, N. Y.; D. S. Laing and F. H. Holmes, of East Otto, are directors.

GRANGER, GEORGETOWN, AUSTIN & SAN ANTONIO (M., K. & T.).—This new line in Texas, which is building from Granger to San Marcos, about 80 miles, has been completed between Granger and Georgetown, 18 miles, and was opened for traffic between these points on April 25. Chas. McSweeney, Houston, Texas, contractor.

HARDMAN'S BRANCH.—This company has been chartered in West Virginia, to build from Hardman, Preston County, north to Halleck, in Monongalia County, seven miles. F. Foster, Hugh McNeil, Jr., G. F. Smith, all of Baltimore, Md., and J. J. Baumgartner, Westminster, Md., are incorporators.

IMBODEN & ODELL.—This company has been organized in West Virginia, to build 43 miles of line through the lands of the Blue Creek Coal & Land Co. The railroad will connect the Elk River and the Gauley River, and also the Elk River and the Kanawha River. Rights of way are reported secured. C. P. Peyton, Charleston, W. Va., is Chief Engineer, and E. S. Jones, Scranton, Pa., is reported to be interested.

INDIANAPOLIS, SHELBYVILLE & SOUTHEASTERN.—It is stated that work will shortly be begun on the extension of this line from Shelbyville to Elizabethtown, Ohio, 64 miles. The extension will parallel the Cleveland, Cincinnati, Chicago & St. Louis from Shelbyville to Batesville. East of Batesville it will cut across the north end of Dearborn County in a direct line to Elizabethtown.

KANSAS CITY, MEXICO & ORIENT.—An officer denies that this company has been making surveys for a new branch line from San Angelo, Texas, to Tampico, Mex.

KINGSTON & FRONTENAC.—Application is being made at the current session of the Ontario Legislature for the incorporation of a company to build a steam or electric line from Kingston to Loughborough Lake, and from Loughborough Lake to a point on the Kingston & Pembroke. McGiverin & Haydon, Ottawa, are interested.

KOKOMO, MARION & WESTERN TRACTION.—The contract for building this electric line between Marion, Ind., and Kokomo, 25 miles, has been let to the Indiana Traction & Construction Co. The contract calls for the completion of the line by August 1. O. V. Darby, Kokomo, Ind., is President. (March 27, p. 240.)

LAKE KEUKA & EAST SIDE (ELECTRIC).—Articles of incorporation have been filed by this company in New York State. The company proposes to build an electric line from Penn Yan, Yates County, N. Y., to Keuka, Steuben County. J. C. Harris, New York City; W. H. Fox, M. F. Shepard, of Penn Yan; D. E. Hoover, of Keuka, and others, are incorporators.

LINDSAY, BOBCAYGEON & PONTYPOOL.—Arrangements have been completed for building this line, which is projected from Pontypool, Ont., on the Canadian Pacific, north to Lindsay and thence northeast to Bobcaygeon, 40 miles. The new line will pass through a large farming district, and will form a link in the new short line between Toronto and Ottawa, which is being built by the Toronto, Lindsay & Pembroke. W. T. Jennings, Toronto, Ont., is Chief Engineer. T. Stewart, Lindsay, Ont., and H. J. Wickham, Bobcaygeon, Ont., are largely interested. (See Construction Supplement).

LITTLE KANAWHA (WABASH).—It is reported that work has been stopped on the extension of this line from Zanesville, Ohio, to Parkersburg, W. Va., on account of the high price of materials and labor. (See Construction Supplement.)

LORAIN, AMHERST & WELLINGTON.—This company has been incorporated in Ohio to build from Lorain to Wellington, 20 miles. J. A. Beidler, J. M. Gundry and others, of Cleveland, are incorporators.

MIDDLESBORO MINERAL.—It is said that this company will build a line from Middlesboro, Ky., to Harlan, 30 miles, and thence along the Cumberland River valley to Leslie County, 20 miles. Rights of way through the Harlan coal fields are reported secured and it is said that work will shortly be begun. Henry Fonde, Knoxville, Tenn., is said to be interested.

MOREHEAD & WEST LIBERTY.—Press reports state that work has been resumed on this road from Morehead to West Liberty, Ky., 25 miles. The line was partially built in 1901, but was temporarily abandoned.

MORELIA & TACAMBARO.—Contract has been let to Lowell & Mason, of Baltimore, for building and equipping this Mexican railroad. The proposed route is from Irapuato, on the Mexican Central, south to Morelia, capital of the State of Michoacan, and thence through Tacambaro west to Ario, the western terminus, 225 miles. W. A. Buckman, W. A. Holcombe, of Trenton, N. J., and others, are said to be interested. (See Construction Supplement.)

NACOZARI R. R.—It is reported that this company will extend its line to Nacozari, Mexico, 22 miles. The proposed route is from Agua Priete to Nacozari, 74 miles, of which 52 miles were completed in 1900. J. S. Douglas, Douglas, Ariz., is interested. (See Construction Supplement.)

NORTHERN PACIFIC.—Track laying is reported begun on the extension from Grand Coulee, Wash., to Adrian, on the Great Northern, 20 miles. Larson & Foley, Spokane, Wash., are the contractors. The line will probably be completed about Aug. 1. (See Construction Supplement.)

OKLAHOMA ELECTRIC.—A territorial charter has been granted this company in Oklahoma, to build electric lines from Oklahoma City south to Norman, 15 miles; west to El Reno, 25 miles, and southeast to Shawnee, 30 miles. F. B. Zeigler, J. T. Alexander and others, all of Oklahoma City, are interested.

PEARL & LEAF RIVER.—An officer writes that this company will build 9¼ miles of railroad from Prentiss, Miss., to Silver Creek, connecting at the latter point with the Columbia-Mendenhall branch of the Gulf & Ship Island. This extension will be laid with 80-lb. steel rails. W. A. Stevenson, Hattiesburg, Miss., is General Manager.

PERE MARQUETTE.—Contract has been let to McArthur Bros., Chicago, for building the first section of the extension of this road toward Chicago. The contract covers the section from New Buffalo, Mich., southwest to Porter, Ind., 20 miles, where a connection will be made with the Elgin, Joliet & Eastern.

RIO GRANDE & SOUTHWESTERN.—Surveys are reported finished for a line from Lumberton, N. Mex., via El Vado to Galena, 42 miles. Rights of way have been secured and contracts will shortly be let. E. J. Yard, Denver, Colo., is Chief Engineer. E. M. Biggs, Edith, Colo., is President.

SOUTH BEND & SOUTHERN MICHIGAN (ELECTRIC).—An officer writes that grading on this new line is practically completed and that track laying will shortly be begun. There will be three steel bridges ranging from 70 ft. to 310 ft. in length. The line will probably be finished as far as Niles by June 1. C. H. Defrees, South Bend, Ind., has the contract for track laying. A. J. Hammond is Chief Engineer. (April 24, p. 304.)

SOUTHERN.—Press reports state that 2,000 men are now at work double tracking the main line of the Southern from Alexandria, Va., to Manassas. The contract calls for the completion of this part of the work by July 1. The double tracking will then be extended to Orange, Va.

SOUTH SHORE TERMINAL.—This company has been incorporated in Ohio to build from Conneaut west to Toledo, Ohio, 150 miles, with a branch from Lorain south to Ashland. H. C. Burrell, A. H. Babcock, Jr., W. A. Benson, of Cleveland, and others, are interested.

TRAVERSE CITY, LEELANAU & MANISTIQUE.—Track laying has been begun on this line from Traverse City, Mich., north via Hatch's, Bingham and Omena to Northport, 30 miles. The line will probably be completed and ready for operation about July 1. (See Construction Supplement).

TRINITY & BRAZOS VALLEY.—Work is progressing rapidly on this line from Cleburne, Texas, south to Mexia, 30 miles, and it is said that a part of the line will be opened for traffic about the first of July. Surveys are now in progress for an extension southeast from Mexia towards Trinity and Huntsville.

VALDEZ, COPPER RIVER & YUKON.—The first consignment of rails for this company has arrived at Cook's Inlet, and it is stated that work will be begun immediately. This company was incorporated in May, 1902, to build a railroad from Valdez, Alaska, through the Copper River Valley to Eagle City, about 400 miles. The contractor for the first section of the road is reported to be J. P. McDonald. (See Construction Supplement).

VANCOUVER, VICTORIA & EASTERN.—Press reports state that work will be begun immediately on an extension of this line from Grand Forks, B. C., northwest to Phoenix, 24 miles.

WALLINGFORD TRAMWAY.—A bill has been passed by the Connecticut Legislature granting a charter to this company, with power to build an electric railroad which when done will form the final link in a continuous trolley line between New York and Boston. The new line will run from Wallingford through North Haven to Montowese, where connection will be made with the Fairhaven & Westville. The company is capitalized at $500,000. W. J. Leavenworth, F. A. Wallace, C. B. Yale, R. T. Ives, all of Wallingford, are interested.

WASHINGTON PACIFIC.—Articles of incorporation have been filed by this company in Oregon. No proposed route is given but the company is expected to build a line in Chelan and Douglas Counties. John Atkinson and A. D. Frater, Eugene, Ore., are said to be interested.

WASHINGTON ROADS.—The Northwest Coal & Coke Co. is about to build 17 miles of railroad to connect its new coal fields with the Crow's Nest Division of the Canadian Pacific. Donald McLeod, of Nelson, B. C., is the contractor.

WETZEL & TYLER (ELECTRIC).—A charter has been granted this company to build and operate an electric line from New Martinsville, Wetzel County, W. Va., southwest to Sistersville, Tyler County, 10 miles. T. A. Watkins, H. H. Freeman, Geo. R. Wallace and others, of Pittsburg, Pa., are said to be interested.

YAZOO & MISSISSIPPI VALLEY (ILLINOIS CENTRAL).—Contract for the extension of this line from Swan Lake northeast to Yarbro, Miss., 50 miles, has been let to McArthur Bros. & Co., Chicago.

Work is reported renewed on the extension of this line from Mattson, Miss., south to the State convict farm, about 15 miles.

GENERAL RAILROAD NEWS.

BESSEMER & LAKE ERIE.—See Pere Marquette below.

BROOKLYN & ROCKAWAY BEACH.—The People's Trust Co. has begun proceedings to foreclose a mortgage for $350,000 made in April, 1891. Interest on the bonds has not been paid since November, 1899.

DELAWARE & HUDSON.—It is reported that this company has secured control of the recently organized Binghamton & Southern, which is to be built from Binghamton, N. Y., to Williamsport, Pa. Surveys are practically completed for the new line.

GULF & CHICAGO.—An important step in the transfer of this company to the Mobile, Jackson & Kansas City has recently been made by the underwriting of bonds to the amount of $5,000,000, by the Alabama Security Co., trustee. The proceeds from this sale will be used for making the Gulf & Chicago a standard gage line, and for the extension of this line to a connection at Jackson, Tenn., with the Mobile, Jackson & Kansas City, which is now in operation between Mobile and Hattiesburg, Miss.

HOUSTON & TEXAS CENTRAL.—The true condition of the relations of Rock Island and the Southern Pacific to this road has been officially announced. A tripartite traffic agreement has been made between the Houston & Texas Central, the Rock Island and the Southern Pacific lines, so that traffic can be harmoniously conducted while still complying with the law forbidding consolidation of competing railroads. Freight Traffic Manager H. A. Jones says: The separation of the offices and officials of the Houston & Texas Central and the Texas & New Orleans was necessary, as the Southern Pacific had taken up the operation of the Texas & New Orleans's Dallas extension. Under the laws of the State the Southern Pacific could not participate in the operation of both lines, they being competitive.

HUDSON & MANHATTAN.—The proposed Hudson & Manhattan tunnel under the Hudson River has recently secured certain rights on Manhattan Island which are described as follows by the New York *Commercial Advertiser*: The tunnel will follow the south side of Cortlandt street to a point about 50 ft. west of Church street. A curve at this point will bring it under the property purchased by this company and extending about 60 ft. west of Church street. It will then continue under Dey street to Fulton street, where the company's property ends. Here it will curve west and pass along under Fulton street, curve again south and return to Cortlandt street by way of Greenwich street, following the north side of Cortlandt street to the river.

MOBILE, JACKSON & KANSAS CITY.—See Gulf & Chicago above.

MUSCATINE NORTH & SOUTH.—This road will be sold to satisfy a mortgage of $450,000. The Muscatine North & South extends from Muscatine, Iowa, south to Elrick Junction, 80 miles. The property went into the hands of a receiver in March. Charles Howard, formerly General Manager of the road, was appointed receiver. The road was built about two years ago as a feeder to the Iowa Central. (March 20, p. 220.)

NORTHERN SECURITIES.—The first financial statement published by this company, shows an income account for the period from Nov. 13, 1901, to Dec. 31, 1902, as follows (cents omitted):

	Dr.	Cr.
Dividends received	...	$15,364,261
Expenses of administration	$93,577	
Interest and exchange	258,417	
Taxes	190,513	
Dividends paid	14,063,645	
Surplus	758,107	
	$15,364,261	$15,364,261

The balance sheet of Dec. 31 last shows:

Assets.	
Charter account	$85,048
Investments—railroad stocks	360,343,332
Other investments	5,214,951
Accounts receivable	810
Cash	32,797
	$365,676,940

Liabilities.	
Capital stock	$364,867,848
Vouchers payable	50,461
Accrued rental offices	523
Profit and loss	758,107
	$365,676,940

A circular sent out with this statement says: "The earnings of your properties have, since their purchase, largely increased, and their actual value has been materially enhanced and cannot be impaired even though the decisions in any of the suits brought against it should be adverse to your company."

PERE MARQUETTE.—The directors of the Pere Marquette and the Bessemer & Lake Erie railroads have just closed a 99-year contract providing for the interchange of business between these companies across Lake Erie. An issue of $500,000 4½ per cent. 30-year gold bonds will be made, principal and interest guaranteed jointly by the Pere Marquette and the Bessemer & Lake Erie. One-half of this issue has already been purchased by the United States Steel Corporation for one of its sinking funds. These two companies, together with the United States Steel Corporation, have bought the docks and properties of the United States & Ontario Steam Navigation Co., under the name of the Marquette & Bessemer Dock & Navigation Co. It is estimated that the alliance with the Steel Corporation will give this railroad additional traffic of nearly 1,000,000 tons annually. (March 6, p. 176.)

PITTSBURG & LAKE ERIE.—At a recent meeting of the directors of this company, it was voted to increase the capital stock from $8,000,000 to $10,000,000, the funds to be used mainly for additional tracks to complete a four-track line between Pittsburg and Youngstown. About 70 miles of new track will be needed. A special meeting of the stockholders will be held on June 29 to vote on the question.

QUEBEC ROADS.—The following railroad companies were granted incorporation at the last session of the Quebec Legislature: Quebec Oriental Ry.; Montreal Northern; Montreal & James Bay; St. George Electric; Valleyfield Electric, and the Roberval Electric.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—This company has filed a certificate with the Secretary of State, providing for an increase of capital stock from $69,000,000 to $119,000,000. (March 6, p. 176.)

SPRINGFIELD & XENIA TRACTION.—This company has been sold to the Bushnell Syndicate of Springfield, Ohio. Incorporated under the title of the Little Miami Traction, in 1901, it later changed its name to the present one. The road is 22 miles long, from Springfield to Xenia, and was built by J. R. Nutt, of Akron. J. E. Bushnell, Springfield, Ohio, has been elected Vice-President of the new company.